

SUPPLEMENT.

The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE;

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

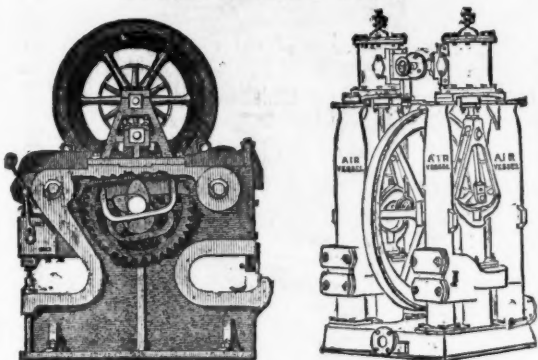
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PARIS, BRONZE MEDAL, 1867. ORDER OF THE CROWN OF PRUSSIA. FALMOUTH, SILVER MEDAL, 1867.

A DIPLOMA—HIGHEST OF ALL AWARDS—given by the
Geographical Congress, Paris, 1875—M. Favre, Contractor, having
exhibited the McKean Drill alone as the MODEL BORING MACHINE
for the ST. GOTHARD TUNNEL.
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ing during January was 121-30 metres, or 133 yards.

In a series of comparative trials made at the St. Gothard Tun-
nel, the McKean Rock Drill continued to work until the pres-
sure was reduced to one-half atmosphere ($7\frac{1}{2}$ lbs.), showing
almost the entire motive force to be available for the blow
against the rock—a result of itself indicating many advantages.

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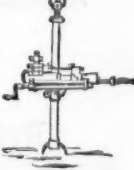
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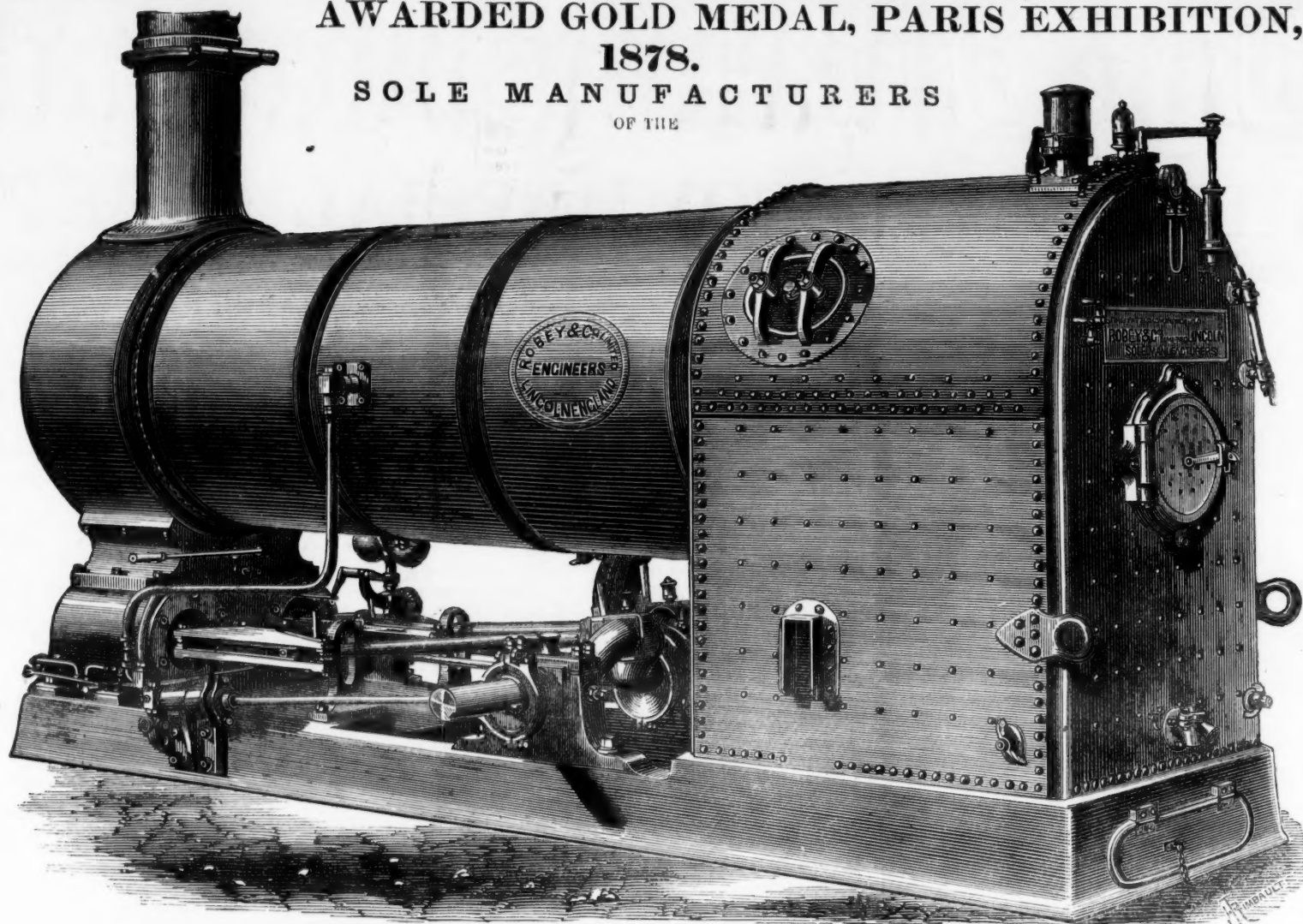
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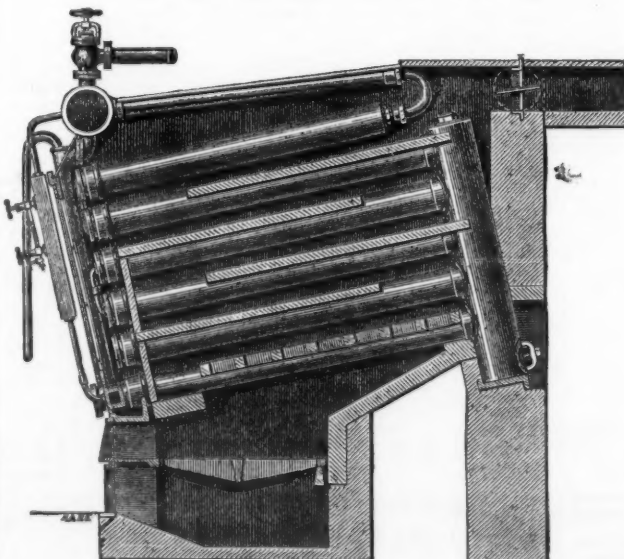
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THE RIO TINTO COMPANY—THE HUELVA DISTRICT.
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SIR,—I have read with great pleasure the interesting letter from Capt. Burnaby, which appeared in the Journal of Saturday last. It has often struck me, as it has, probably, done many others similarly interested, that it was a great pity so large a quantity of ore should be annually consumed in the Huelva district, with the sole object of extracting therefrom but one of its constituents—the copper—and which forms only from 2 to 3 per cent. of the total weight. Undoubtedly, therefore, the prospect that another constituent (the iron) is likely to be utilised must be a source of satisfaction to all concerned. There is, however, a more valuable constituent than the iron—the sulphur, which is also at present wasted, being driven out in the form of destructive gases into the surrounding atmosphere, the frightful effects of which are referred to by your gallant correspondent. It is greatly to be hoped that the directors and officials of the company will devote due consideration to this part of the question, as it is of vital interest to the investors in these mines that the enormous quantity of sulphur hitherto wasted should, if possible, be utilised, with a view not only of adding to the revenue, but of avoiding the complications that may arise from a continuance of the present obnoxious system. There are, doubtless, difficulties in the way, but science can get over great difficulties, and some economical process can, probably, be suggested—in fact, one has recently been described in your columns that appeared to promise a solution of the question—I refer to the Holloway process, and trust that the same will be duly considered by the company. It is true I see that this process is condemned by the writer of another letter in the Journal, but an anonymous communication can hardly be considered by an unprejudiced person of much weight against the very favourable opinions expressed by the various speakers at the Society of Arts, as detailed in your Journal of the 15th ult.—London, March 4. A RIO TINTO SHAREHOLDER.

GOLD MINES IN THE JACOTINGA FORMATIONS
OF BRAZIL.

SIR,—“There is something in the search of gold which exalts the imagination, and the most extravagant and visionary tales are caught at and credited.” These words of an old author on Travels in Brazil came to my mind when I read some private remarks on the latest reports from the Don Pedro Mines. The mine report stated that a vein had been cut in the bottom of the mine, and 13 to 14 lbs. of this veinstuff had produced 53 grs. of gold. These figures given, your correspondent, no doubt, in a perfectly bona fide way, calculated the lode now to be worth 1300l. per fathom. Fortunate indeed would be those who cast in their lot in this mine if this were real and not ideal. The Don Pedro Mine would then do its part to make up for the general deficiency of the world's gold produce, which, according to statistical accounts, has constantly declined during the last 20 years, and is at present short of the annual consumption by about 7,000,000l. sterling. The profits of the mine would not only be double that of the best years, but would come out to something like 1,500,000l. per annum. Although there is no chance of such estimates ever being realised, it is, nevertheless, highly gratifying to read the late reports of the manager and captains in their real bearing on the future prospects of those mines. The technical terms of those reports, such as veinstuff, general work, lode, shoot, &c., are not generally understood; hence mistakes like the one pointed out. I shall be glad if I succeed in the following notes, now that attention is again more generally directed to the Brazilian mines, to give a clearer idea of gold mining on jacotinga formations.

Micaceous iron, iron glance, and magnetic iron ore in solid rocks and of fine-grained structure enter so largely and independently into the constitution of the geological configuration of Minas Geraes that it is justified to consider them as a species of rock peculiar to the country under the name of jacotinga formation. The mineral thus denominated by the ancient Brazilian miners is a pure iron ore, and forms a fine-grained rock of distinctly foliated structure. In some localities it alternates with thin layers of white quartz, giving to the whole formation a ribbon-like striped appearance of a whitish and iron-grey colour. Pure specimens of the mineral contain 97 per cent. of sesquioxide of iron, 0.15 to 0.20 per cent. of manganese, 0.30 per cent. of lime, and 1 to 2 per cent. of silica. Strata of jacotinga of stupendous magnitude traverse the mining district of Minas in four distinct formations, which have a width from $\frac{1}{2}$ to upwards of 1 mile, and a longitudinal extent of 30 to 40 miles; they are, in fact, mountains of iron ore. The direction of these strata is generally N.N.E. to S.S.W., with an inclination towards E. The jacotinga is frequently superincumbent to the stacoleonite, a rock likewise peculiar to the country, and which is chiefly a fine-grained quartz, united by thin laminae of chlorite and talc.

I believe gold has been found and mining carried on at all four formations, but it must not be supposed that all the jacotinga is auriferous. There are only some of the beds which contain the precious metal in a limited longitudinal extent, and these sections are called by the miners lodes. While the whole bulk of these lodes is in some degree auriferous, they contain again a number of veins, pre-eminently rich, and generally well defined, dipping invariably north-east. These veins are sometimes also termed lines of gold, and vary in size from 1 in. to several inches and even feet in thickness; they approach in one locality of the lode more the headwall, in another more the footwall, and are considered particularly rich when accompanied by mineral having the appearance of a very friable grey sandstone. Bunches are very rich accumulations of gold, and it has been found that those encountered in the deeper workings of the Maquiné Mine have always been richer than those met with in the higher parts of the lode; it is considered a very good sign when the iron accompanying the gold in the bunches assumes an hydrated frosty appearance.

It has been the general practice in jacotinga mining to pursue and excavate the veins of gold as soon as discovered, either by rising or sinking diagonal excavations from different levels, and the product of such workings is termed veinstuff or boxwork, because it is transported to the reduction works in locked boxes. The ground between the lines or veins, and that above and below them, though generally auriferous, is for the time left standing, to be excavated by the general stopping afterwards. There are, therefore, generally two distinct stopping operations—a system which in general mining would be considered unfair working, but which in this kind of mines has certainly its advantages; it facilitates a proper separation of the concentrated rich veinstuff from the poorer mineral, a necessity commanded both by the requirements of the extraction process and on account of the facility with which gold may be extracted by the workpeople if left in the general stopes.

The Maquiné Mine of the Don Pedro North del Rey Company works on a jacotinga formation, which covers an area of 20 square miles. At the mine hill six beds of jacotinga can be observed; several of them have been extensively worked on by Brazilian miners, but the fame of locality was almost buried in oblivion by the long abandonment during more than 100 years, until in 1853-4 the present works were commenced. Out of the eight beds only two have been hitherto more extensively explored—the first one, or the uppermost in the series, and the third one. The lode or auriferous part of this bed has an average width of 7 ft., and a longitudinal extent of from 40 to 50 fms., dipping easterly into the mountain. In this auriferous shoot of ground, as it may be termed, some six veins of gold are known to exist, which follow the general dip of the shoot at an inclination of 20° to 28°. The mine has turned out in the best of years about 500 to 600 tons of veinstuff per annum, containing from 12 to 18 ozs. of gold per ton; and 24,000 to 30,000 tons of general work—that is, material of the lode after the rich veins have been extracted. The produce per ton of all the mineral treated used to average about 1 oz. 20 grs. of gold, and left those splendid profits during the bright days of Don Pedro, which, there is reason to hope, will dawn again as soon as the present technical difficulties are once more overcome.

After the decadence of the celebrated George Soco Mines, which

had extracted from jacotinga 34,528 lbs. troy of gold, valued at 1,427,064l., and after the non-success of some other undertakings, jacotinga mining was considered a questionable enterprise by English capitalists, and for years quite neglected. There is certainly a notable difference between this class of mines and those working on auriferous quartz and pyritic lodes; the latter exhibit a greater uniformity in the dissemination of the gold throughout the lode, while the yield in jacotinga mining, in consequence of the varying nature of the veins in different sections of the lodes, is much more fluctuating. The miner may strike at any moment into a bunch of rich stuff in which lumps of almost pure gold are found, equalling in value the aggregate produce of 20 or 30 tons of auriferous quartz and pyrites, and then fathoms of ground may be passed before such lucky hits are made again. But there is a way if not of equalising the produce at least of counteracting to some extent the influence which those rapid fluctuations have on shares and investors' minds, and this is solely to be found in pushing on the explorations of the lode well ahead of the actual stopping by sinking the shafts more rapidly, driving levels, and thus opening the ground, so that the future yield may be calculated with some certainty by the reserves. Jacotinga mining also can thus be deprived of a deal of its present more speculative nature. It may hitherto not have been possible or practicable to do this at the Don Pedro Mine to the full extent, for after all it is a comparatively young mine, and has been brought to astonishing rapidity from its infancy to a high pitch of productiveness; but, perhaps, in future the principle of creating extensive reserves in the mine will receive more attention.

Zimmerstrasse, Darmstadt.

F. DIETZSCH.

P.S.—My next article will be on gold mines in other formations.

MINING PROSPECTS ON THE PACIFIC COAST.

The long existing quarrel between the Sutro Tunnel Company and the Comstock Mines has at length been amicably settled. Mr. Sutro, who has struggled for ten years against the combined power and influence of the mineowners, has gained his point. The mines have agreed to pay the royalty, and there the matter ends. When this result was known it created great excitement in mining circles. The accumulation of water in several of the mines had done much to impede development, to add to the expense of working, and in some cases to entirely prevent further progress. This serious difficulty will now be removed, as these mines will be speedily and effectually drained by the Sutro Tunnel. In consequence of this being known stocks on the Comstock lode took an immediate rise, and other stocks felt a sympathetic influence. It is safe to say that we are on the eve of very lively times in the Stock Market, at least this is the opinion of the general public, who are looking forward to and expecting a more prosperous period than we have had for some years past.

It may interest some of your readers to learn the following particulars regarding the material prosperity of the State for the past year. The figures are taken from the Commercial Herald, and have just been published:—Wheat product in 1878, 22,500,000 cents; wheat and flour exports, 9,520,673 cents. Gold and silver yield, \$35,000,000; coinage in San Francisco Mint, \$50,186,500. Mining stock sales on San Francisco Board, \$148,257,585. Quicksilver product, 63,500 flasks. The same authority gives the following table of the product of leading mines and mining localities on this Coast:—The figures given are in most cases official, and in all very nearly accurate.

PRODUCT OF CALIFORNIA MINES. HYDRAULIC—NEVADA
COUNTY.

North Bloomfield	\$315,000
Milton	540,000
Eureka Lake and Yuba Canal	820,000
Blue Banks	125,000
Other mines on the San Juan Ridge	500,000
Blue Tent	92,000
Nevada	100,000
Little York, H. M. Co.	125,000
The Quaker Hill, Birdseye Creek, and other companies operating on the ridge between the South Yuba and Bear river	500,000

PLACER COUNTY.

Mines about Dutch Flat and Gold Run	\$700,000
Mines on the Forest Hill Divide	350,000

SIERRA COUNTY.

Brandy City	\$ 45,000
Morgan Claims	63,000
Poverty Hill	25,000
Mines at Gardner's Point, Scales Diggings, and elsewhere in the county	500,000

YUBA COUNTY.

Excelsior W. and G.	\$300,000
Other mines about Smartsville	200,000
South Feather River and other mines in the county	150,000

BUTTE COUNTY.

Spring Valley Company at Cherokee	\$253,550
Other companies in Butte	150,000

PLUMAS COUNTY.

Conly and Gowell, La Porte	\$ 33,200
Sawpit Flat	27,000
Other mines in the county	100,000

SHASTA COUNTY.

Dry Creek T. and F. Co.	\$ 60,000
Other mines in the county	30,000

The several counties mentioned below may be credited with the sums attached to them respectively, on account of yield from their hydraulic mines—Trinity, \$1,500,000; Siskiyou, \$1,000,000; El Dorado, \$500,000; Amador, \$300,000; Calaveras, \$100,000; Tuolumne, \$150,000; the La Grange in this county having produced \$35,600.

DRIFT MINES.

This class of mining is mostly confined to California, where there are a great number of parties operating by this method on a small scale, and who take out annually all the way from \$1000 or \$2000 to \$40,000 or \$50,000 each. The following comprises most of the larger companies in the State, with their product for the past year:—

Bald Mountain, Sierra county	\$40,000
Empire, Sierra county	100,000
Enterprise, Sierra county	200,000
North America, Sierra county	180,000
Buckeye, Plumas county	160,000
Damasco Company, Placer county	175,000

VEIN MINES.

Bodie, Mono county	\$1,200,000
Standard, Mono county	1,014,000
Rechtel, Mono county	45,000
Comanche, Mono county	171,000
Idaho, Nevada county	609,400
Empire, Nevada county	104,600
New York Hill, Nevada county	40,000
Hite M., Mariposa county	250,000
Black Bear, Siskiyou county	155,000
Sierra Bites, Sierra county	155,000
Original Co., Sierra county	212,300
Con. Amador, Amador county	25,000
Keystone, Amador county	90,000
Lincoln, Amador county	200,000
Original Amador, Amador county	100,000
Plumas Eureka, Plumas county	73,000
Modoc Co., Inyo county	451,200
New Com Co., Inyo county	300,000
.....	75,000

STATE OF NEVADA.

California, Washoe	\$10,940,078
Con. Virginia, Washoe	7,998,753
Justico, Washoe	253,859
Chollar-Fotosol, Washoe	48,800
Crown Point, Washoe	52,000
Optim, Washoe	91,400
Trojan, Washoe	75,700
Endowment, Esmeralda county	60,000
Northern Belle, Esmeralda county	614,400
Hill Side, Lincoln county	131,130
Raymond and Ely, Lincoln county	259,780
Other mines in Ely district	260,000
Tybo Co., Nye county	737,170
Gila, Nye county	48,482
Alexander, Nye	118,700
Tuscarora district	1,327,858
Ely Pateh Co., Humboldt county	75,900
Eureka Co., Eureka county	5,491,900
Richmond Co., Eureka county	3,800,000
Hamburg, Eureka county	65,000
K. K. Co., Eureka county	237,500
Manhattan, Lander county	1,121,200
Ward, White Pine county	100,000
Martin White, White Pine	254,400
Stak, White Pine county	392,600

ARIZONA.

McCrackin Con.	\$336,600
S. Signal	100,000
Blackberry	200,000
N. Meral Park	150,000
Pack	300,000
Tip Top	302,000
Aztlan	30,000
Smith's Mill	12,000
Silver King	600,000
McMillan	100,000

UTAH.

Christy	\$302,500
Leeds	226,200
Ontario	1,456,100

DAKOTA.

Deadwood	\$117,500
Father de Smet	82,300
Homestake	297,000

San Francisco, Feb. 7.

E. J. J.

COLORADO UNITED MINING COMPANY.

SIR,—The chairman has received further communication from Mr. Andrews, the secretary, dated 10th and 12th of February, in which he states that the arrangements for the future management of the company's property have made satisfactory progress. The interest payable on the debt in Colorado has been materially reduced. Since the mines and dressing works have been under Mr. Hamill's personal superintendence greater economy has been exercised in the working, the result being that the accounts for January show a profit in excess of \$5000—a sum which will be applied in reduction of the debt. Confident assurances are given that the entire debt will be liquidated out of the profits by the month of July.

By order of the Board,
London, March 5.

H. J. MACRAE, for Secretary.

THE CAPE MINES.

SIR,—I hear from an acquaintance that a “friendly” suggestion has been thrown out—that because the Wallaroo Copper Mines are now stopped, owing to the unremunerative price of copper, the Cape Copper Company should go and do likewise. This is very like the fable of the fox who has lost his tail advising his fellow foxes to curtail themselves also of this appendage. As long as the Cape Company can make the fine profits coming in (and the stoppage of other mines is sure to enhance them) they will do no such thing; they cannot afford to let their railroad and establishment lie idle to enable the Wallaroo to resume work. Of all mines the Cape Copper is the most independent one, owing to its cheap production and the extraordinary richness of its ores. As far as the advice so kindly tendered goes, all I can say as a shareholder is—“Save me from my candid friends.”—March 5.

W. W.

SURFACE CONDENSERS.

SIR,—In my communication of last week on this subject to which you kindly gave space I notice a very important misprint, which I will thank you to correct. In commenting on the advantages Tinicroft would derive from a reserve fund I said—would it not enable it to increase its produce two-fold, not ten-fold. Wm. NANCE, 22, Stanley-street West, North Shields, March 3.

IMPROVEMENTS—THINGS OLD AND NEW.

SIR,—In my last I touched very briefly on surface condensers—the introduction of the boring machine into Cornwall, the anomalies which impede its progress, electric blasting, the successful application of the boring machine out of Cornwall to shaft sinking, the great advantages of cage-winding versus kiddles, skips, &c., and will now, with an extension of your amicability, endeavour to add a few more remarks on some other points of not less importance to mining in general. Reverting to shaft-sinking I would add that a great impediment to its progress, whether by hand or machine, arises in many mines from improper arrangements in bringing the water to the pump-cisterns, which, like admitting the water in a foul state to the boilers, occasions very serious loss. In many shafts the water is admitted direct from the levels, with a strong current into the pump-cisterns, bringing with it a large quantity of sand and mud, and very often chips of wood—a portion of which is naturally drawn into the pump, and interferes with the proper working of the clocks and valves, causing them to leak almost directly they are put in, which, of course, occasions great waste of fuel on the engine, and farther their rapid destruction, necessitating the stopping of the engine to charge them, and, consequently, causing an accumulation of water in the bottom, which is the greatest impediment to shaft sinking. The remedy, however, is a simple one, and consists in making a pit in the bottom of the level about 10 fms. from the shaft, and then taking the water from this pit to the pump cistern in a good-sized launder, laid down at nearly a dead level—so that all the matters in suspension, and especially, may become deposited before the water is admitted to the pump cisterns; and then, if care is taken to clean out these receptacles when the engine is stopping for repairs, none of this dirt will enter the pump. To prevent the chips entering, which is another great source of annoyance and hindrance, it is only necessary to wrap a wire gauze around the bottom of the wind-bore, so as to cover the admission holes. I have no doubt that a little attention to this will tend greatly to accelerate the sinking, as well as to economise a great unnecessary waste. Another important improvement in deep mining is the means applied for sending the men down and bringing them up—which, when they had to make the journey by ladders, was certainly the greatest hardship required of them in their day's work, being at the same time the most unhealthy exercise in their profession. In Cornwall and Germany it consists of the man-engine, whilst in the North of England and many other places they are let down and drawn up by the rope, very often in a kibble without any guides. Those who are used to it think nothing of it; in fact, they have quite as much repugnance to climbing ladders as the Cornish men have of riding in a kibble. This system of winding them up and down becomes much less dangerous when a cage, provided with proper guides, safety-catch, and detaching-hook, is used. The catch prevents the cage falling in case the rope breaks, and the detaching-hook prevents over-winding—or, rather, allows the rope to go over the shieve whilst the cage remains suspended by the catch, without injury of any sort. The advantage of this system is that the men are passed through the same compartment as the products of the mine, whilst the man-engine, although much safer, requires a separate compartment to work in. This system, then, which I recommended in my last as a very efficient means of hoisting, and which is also capable of carrying men with tolerable safety, probably with less danger than there is attached to making the journey with the ladders, considering the strain on the lungs, is not to be compared to the man-engine for safety, by which it is almost impossible to receive any hurt except through carelessness. By this great improvement, combined with the ventilation and cooling effects of the compressed air escaping from the boring machine, mining is rendered less unhealthy and inconvenient at 500 fms. deep than it is at 100 fms. without these means.

Whilst considering this mode of winding I would remark that some objections were made to its adoption in Cornwall some years ago, or rather to the skip, which is about the same thing, in consequence of the difficulty experienced in getting the skip to work at the bottom level whilst the sinking was continued below. This difficulty arose from the old system of fixing the pent-house in a sloping position, at an angle of about 60° from the bottom of the plat upwards, and in consequence of this the skip could not be brought down until the shaft was down to another level—so that all the debris and ore had to be hoisted from the shaft and bottom ends to the level above until then. An improvement was made by having a bench of ground under the skips for pent-houses, the top of which was about 3 ft. under the bottom of the plat, and jolting the shaft back under it to its proper length again, and the bench taken away after the shaft was got down to the next level. This contracted the space for the windlass; but by swinging the sinking lift up to screws, instead of putting in stays around it to keep it standing on its end, sufficient room was made for that purpose.

—and this formed a good strong pent-house in hard ground; but where the ground is soft a temporary one should be made in the same position with timber or masonry, and the skips or cages can then be worked as near the bottom as the kibble does with the old contrivance. Now that compressed air is coming into use this windlass can be easily replaced by a small winding engine fixed in the plat and worked by that power, which would occupy less space in the shaft than the windlass, and at the same time be far more powerful and expeditious in clearing the way for the re-entrance of the boring machine to its work. Seeing, then, that we have such efficient means of relieving the men of the severe penance of climbing ladders, and of accelerating and economising the hoisting, it will probably appear surprising to some at first sight that they have been applied only to a very few mines; but when we consider the difficulties in the way that surprise no doubt will disappear. I have already pointed out that the shafts in Cornwall are, as a rule, too small for the cage, and, of course, for the same reason the man-engine cannot be got to work.

To make new shafts is a question of several years work and several thousand pounds capital. To alter the old ones means a sacrifice of a great portion of the produce for a year, and in some mines the whole of it for a similar period—so that it is not an easy matter to apply these improvements in such cases. There are, however, a few mines where it is comparatively easy to apply them, and in making new shafts it is evidently of the highest importance to make them suitable in size and form to meet these requirements. This difficulty of enlarging the shafts to meet the requirements of the boring machine has led me to enquire whether something more cannot be done in them in their present state than is being done by the skip, and I have great pleasure in announcing that I have been successful far beyond my greatest expectation. The invention is now complete, and will shortly be laid before the public. I can wind from two or three levels or even more at the same time through any shaft that is large enough for a skip to work in, and maintain the same ratio of speed and economy as is now obtained by drawing with the skip from one level at a time. That is to say, I can double, treble, or quadruple the hoisting power in any shaft where the skip is working, and with a trifling outlay of only a few hundreds of pounds, according to circumstances—(say) from 500*l.* to 1000*l.*, which will undoubtedly obviate the necessity of making new shafts in many mines, and economise hundreds of thousands of pounds.

The next great improvement which is about to be introduced into mining is the telephone, by which means the manager will be able to converse with his staff at the bottom of the mine quite as well as if they were in his office with him—a matter of great importance now machinery is coming into general use underground. Very often a deal of valuable time is lost in sending a messenger for a mere trifle. The value of this will be appreciated by the pitmen especially, who are often obliged to send messengers because they cannot ask for what they want by the present defective method of signalling, and wait in their wet garbs until his return. The result will be a great economy of time, giving the manager more immediate control over all the interior workings. Important as these improvements are in the interior of the mine improvements of equal importance, if not greater, have been made in the exterior. In copper and lead dressing we have seen the hand-bucking superseded by the Cornish crusher, the spalling and cobbing by Blake's stone-breaker and revolving picking-table, the back-breaking hand jigging by the hand lever machine, to which after a while motion is given by steam or water, requiring only to be served and skimmed by hand, and in its turn give place to the continuous jigger, which is fed and skimmed automatically, being equally conspicuous for the excellence of its work as for the disappearance of a band of thoughtless boys and girls, to which it gave rise.

In tin dressing and lead and copper slime dressing we have seen the old hand buddles and hand trunks replaced by the round buddle and self-acting frames, and the hand tossing and calcing done by steam. These, although great improvements in conjunction with the improved system of feeding them, seem, nevertheless, to lack the efficiency attained by the continuous jigger, which completes its work in one operation; and, considering that tin costs about 9*l.* per ton to dress, the greatest portion being spent in shovelling it over a great number of times, there is evidently wide scope for improvement, and if the tin could be made ready for the burning-house by one operation it would be a great boon to Cornish mining. In Germany a sort of vanning machine has been in use in lead slime and stamp-work dressing for several years, and has been introduced into France with great success, cleaning the poorest work in one operation. It is very much like the old Cornish hand-frame in shape and make, differing only by being a little larger and stronger. It can be fed in a similar manner to the round buddle when fed direct from the stamps automatically. The ore and water which accompanies it is admitted to one corner at the head, whilst a clear stream of water is admitted at the opposite corner. A lateral hanging motion is giving by means of a cam and spring, which is a very near approach to a vanning motion. Sufficient run is given to wash the ore over the tail, which by the time it reaches there (the tail) is projected by the motion to the opposite side to that at which it was admitted, and is carried over the tail into a receptacle placed for its reception; whilst the waste, being projected less, is washed over the tail into the tail-race. A second and third receptacle may be placed to catch the middle and middle head if necessary, or this middle part can be carried direct over a second frame if it is found to retain any ore; but, as a rule, it cleans lead perfectly in one operation, leaving only a very small portion of middles to be re-passed. Lead and tin ores being of about the same specific gravity there is not the least shadow of doubt that it will prove equally successful with one as the other. This I believe is the sort of thing that is likely to produce the desired effect of economising nearly all this enormous hand-labour.

The slimes can be collected and afterwards treated in a similar manner on the vanning tables. The experiment can be easily tried; the cost of the machine is about the same as that of a round buddle, and two of them will keep six heads going on hard stuff. It can be made of wood or of soft cast-iron, which is much more durable.

These improvements, too, have been at the disposition of the mining public for several years, especially the continuous jigger, which has not been introduced into Cornwall with the exception of two mines—I believe West Tolgus and West Chiverton—and the vanning machine not at all. The chief obstacle has been lack of reserve funds, arising in a great measure from over-paid dividends, which is no doubt why many mines are making calls instead of dividends. Another great obstacle is prejudice, which perhaps after all is the most formidable obstacle, seeing that it requires a longer time in some cases to remove it than to obtain the necessary capital. Nor is this obstacle confined to Cornwall. To cite a very remarkable instance of it in the North of England, where high-pressure worn out engines were employed to pump the water, and burning 9 tons of coal per day, a Cornishman offered to do it with a Cornish engine with 1 ton per day, and to reduce their dressing cost from 40*s.* to 8*s.* per ton; but the poor man, to his utter astonishment, was treated with the utmost contempt—the Cornish system in their opinion being the worst, and theirs the best in the world.

What shall we say, then, with all these improvements at our disposal, which appear adequate for the present prosperity of the trade, that inventive faculty must be further taxed to discover a means of extinguishing prejudice and making reserve funds before they can be utilised. Yes, and to be still further taxed to discover a means of shutting up a lot of poverty-stricken mines, which appear to be working for no other reason than glutting the market and ruining their proprietors. It is evident enough with all these facilities of extracting the metals that nothing but the best lodes will pay, and the attempt to make the poor ones pay even now before the machinery is got in full swing is simply glutting the market. Who will succumb, then, in the race—the weak or the strong? It is no doubt very hard to give up all that is invested in a mine; but, hard as it is, it is wiser to do so than to keep throwing away good money after bad, and to those who are building their hopes on any considerable rise in the price of metals I would say their hope is founded on a soft foundation, and to those who will

not believe it I would say wait until these improvements are got into full swing in the good mines, and then I think you will see to your sorrow something the reverse of decreasing stocks of metal—*vide* John Taylor and Sons' letter in the Journal of the 1st instant respecting the advance made by the Beaumont percussion drill at the Halkyn Level Mines Drainage; 800 yards driven in one year. North Shields, March 3. WM. NANCE.

A NEW PROCESS IN METALLURGY.

SIR,—With reference to the letter from your anonymous correspondent, "Miner," dated Truro, Feb. 24, on the subject of Reducing Sulphide Ores without Fuel, it would almost appear that he had not understood my paper, or the discussion that took place thereon at the Society of Arts, on the 12th ultimo. I regret that he did not give his name, as otherwise I would have forwarded to him such information as would have made him change his opinion; but it is impossible, without trespassing too far on your courtesy, to reply satisfactorily to a letter so indefinite.

The experiments clearly proved that by rapid oxidation of protosulphide of iron (without the use of carbonaceous fuel) a much larger amount of heat is obtained than is requisite for smelting pyrites, as well as the necessary silica to produce a silicate of iron slag. If your correspondent is conversant with copper smelting he must know that, provided suitable fluxing materials are added, the heat being sufficient, a slag will be obtained of such a specific gravity that the complete separation of the regulus must follow as a matter of course.

To avoid giving you further trouble I would mention that if any of your correspondents are interested in the subject, and would like to read my paper and the discussion thereon, I shall be pleased to send them copies on application. JOHN HOLLWAY.

Jeffrey's-square, London, March 1.

REDUCING SULPHIDE ORES WITHOUT FUEL.

SIR,—I have read with a feeling akin to amazement the letter of your correspondent, "Miner," in the Journal of the 1st instant.

In the first place, as one of those who heard and took part in the discussion of Mr. Hollway's paper at the Society of Arts, I beg to say that in no case was the opinion of the speakers adverse to the process, though many of them necessarily were unable to pronounce a definite opinion on an invention of so novel a character.

"Miner" next asserts that "Mr. Hollway's experimental data were, without exception, negative so far as concern the production of copper from its ores with the contained sulphur of the sulphides as the only fuel." This statement, while literally correct, is worded so as to express something very different. "Miner" apparently desires to convey the impression that the inventor adduced no evidence in proof of his claim that sulphide ores could be smelted to a regulus without the use of extraneous fuel. Mr. Hollway does not claim nor did he desire to produce metallic copper, and the fact that a small quantity of metallic copper was produced in one experiment, in which the blowing was carried to excess, is simply an indication of what happens when the conditions of ordinary working are not complied with. There is a proverb which says that "women and fools should never be allowed to see an unfinished work," and the saying might evidently be extended with advantage to people like "Miner," who tries to pick a hole by criticising an experiment which ordinary people would understand was simply quoted as an illustration of the results obtained when certain conditions were not existing. Had Mr. Hollway suppressed the results of these experiments, purposely made under very varied conditions in order to test the limits of practical working, your correspondent would doubtless have been among the first to set up a howl.

"Miner" confuses the heat produced by the combustion of the sulphur contained in the sulphides with that obtained by the oxidation of the sulphides. As a matter of fact, there is as much heat evolved by the oxidation of the iron (of the molten sulphides) as by that of the sulphur. Either "Miner" is ignorant of this, or he intentionally mistakes the case, in order that he may be able to say that Mr. Hollway's "experimental data were negative so far as concern the production of copper with the contained sulphur of the sulphides as the only fuel." Why did not "Miner" add the words "and iron" after sulphur? Assuming that "Miner" by the word "sulphur" means the combustible constituents of the ore his statement is demonstrably false.

Dr. Roscoe and some 20 more witnessed an experiment lasting 10 hours in which the contents of the converter were kept in a molten condition, and 18 tons of cold pyrites (besides sandstone) were added, and yet the only source of heat was that derived from the oxidation of the sulphur and iron of the pyrites used. Further comment is useless, and I leave "Miner" to wriggle out of his dilemma as he may.

As to the practical question of the possibility of obtaining a good separation of the cupreous regulus from the silicate of iron slag, your correspondent is directly confuted by the opinion of my namesake, Mr. J. F. Allen, the manager of Messrs. Newton, Keates, and Co.'s Copper Works, at St. Helen's. Mr. Allen had the advantage of witnessing the experiments at Penistone, a facility not possessed by your correspondent, who has also apparently neglected to supply this disadvantage by a careful perusal of Mr. Hollway's paper; and Mr. Allen's opinion was thus given in the discussion at the Society of Arts:—"There is no doubt at all about it that the process is an astonishing success from a scientific standpoint, for the fusion was complete, and the slag seemed perfectly clean. The iron was oxidised, and the regulus settled to the bottom of the converter. This is a point on which there is no doubt whatever. . . . With proper precautions there should be no danger of serious loss of copper in the slag. I think there is every probability that with proper arrangements the regulus would settle down, and that the slag would separate from the regulus. . . . I think Mr. Hollway's process properly carried out promises to be a very great success." So here is one practical copper smelter, at any rate, who does "believe in the practicability of the process."

In conclusion, I may remind your readers that Mr. Bessemer himself was believed to be verging on lunacy when he first proposed to keep up the temperature of molten iron by the combustion of the foreign elements therein; but times have changed since then, and those who were most strongly opposed to the notion have not forgotten to profit by it.

I may add that I am not disposed to continue this controversy with a writer who shelters his reckless statements under a *nom de plume*; but if, after his conviction of inaccuracy, he has the fairness to write in his own name he will find me ready to reply. Sheffield, March 4. ALFRED H. ALLEN.

BLASTING COAL BY COMPRESSED AIR.

SIR,—I saw in last Saturday's Journal a report of the proceedings of the Manchester Geological Society, at which Mr. W. E. Garforth read a paper on the use of compressed air in blasting in coal mines, instead of gunpowder or other dangerous explosives. Permit me to say that his description of the process claimed by him as his invention is copied from my own specification of my own invention and patent, which is dated December 22, 1876, and is No. 4949. Mr. Garforth has had access to my machine, and has had the use of it and seen it used to blow down coal for some time. He has asked me to explain to him how I succeeded in obtaining the enormous pressure I so easily obtained by my process. I have some time since explained to him the whole of the process in the presence of a third person. My specification gives a detailed account of how I propose to use the power when it would be difficult to get even the small machine already made to do the requisite work. I also explained to him the various modes, besides which he has had access to the official specification of my patent, since which time I have not heard from him or conversed with him, and was astonished to read the report of the Geological Society's meeting on Feb. 25, when, before a number of highly influential and intelligent gentlemen, he claimed the invention as his own. I do protest against his claiming as his invention what he knows to be mine. My patent includes three methods of getting coal without explosives, as well as a method of using gases and other explosives for torpedoes, rockets, and for war purposes, as well as the machine

and mechanical method of producing high pressures for other purposes than blasting. In conclusion, permit me to say that Mr. Ellis Lever, of Manchester, and myself are the sole proprietors of the patent, and that we have the sole right to grant licenses, permission to make the machines and cartridges, and to arrange for royalties, &c. SAMUEL MARSH.

Stratford, Manchester, March 4.

EXPLOSIONS IN COAL MINES.

SIR,—The appointment of a Royal Commission appears to be mainly for the purpose of discovering some panacea for those dreadful and ruinous explosions—a task which many will think as likely of accomplishment as the discovery of perpetual motion or the philosopher's stone. The great majority of practical coal miners will, I believe, agree that the causes of those lamentable explosions are pretty well known, and the most useful enquiry, probably, would be as to the best mode of carrying out the late Act, which is generally allowed to be an excellent one; but, like most Acts of the Legislature, means are found to evade to a great extent its provisions. There is one important feature of this Act which, perhaps, ought to receive more attention than other points or minor details—that is, the question of Certificated Managers. There can be no doubt that the framers of the Act intended that this scheme should prove of great benefit in preventing colliery explosions; the intention being that each mine should be under the daily supervision and management of a man actually competent to control all the operations in and about the mine, and also possessed of the power to do this. But has this intention been carried out? The answer is—Very imperfectly, if at all. Such a course would have interfered severely with the interests of many influential men connected with mines—men who manage a number of mines—say, from 6 to 20; and this very important clause of the Act has been to a great extent rendered of no avail. It is true that there is no lack of so-called Certificated Managers about collieries. Shoals of men of various grades and degrees of intelligence have been granted certificates, so that apparently the Act is complied with, but really numbers of these men are what they always were—simply overmen. The intentions of the Act alluded to is in many cases very imperfectly carried out, to use the mildest term.

The questions now coming to the front which must sooner or later be dealt with—that is, the proposed right of miners or their friends to recover compensation for injuries received in mines—is a most difficult one, and the writer does not at present intend to attempt to grapple with it. It is, however, probable that should the right of compensation be conceded under certain conditions—if an Act can be framed on fair principles—such an Act would, perhaps, tend materially to prevent colliery explosions. If a colliery owner had the fear of the consequences of those explosions sufficiently ruinous to him at present, and also the cost of paying compensation to an unknown extent, he would be very careful to provide a really qualified man to manage each colliery, and invest him with sufficient power to do so, just as a shipowner appoints a captain to take the command of each ship he owns.—Newcastle, March 1. M. E.

ROCK-BORING MACHINES.

SIR,—In last week's Journal there is a comprehensive description of certain work done in the Isle of Man by aid of two Darlington rock borers, and also some complimentary references to myself and to the men who have so cheerfully supplemented my efforts to rapidly and economically develop the mine. Though Mr. King's statement fairly represents the case as far as it goes, there are certain omissions in his letter which detract from the importance of the results obtained.

In the first place, our object not being exclusively speed, but to ascertain the contents of the lode, we had to follow it in all its deviations, and when I say that some of the divergences are as much as 30° and 40° in about 4 fms., it will be understood by practical men that it materially impeded forward progress. Besides the loss of ground in the angles considerable time was taken up in curving the wagon-road, bending air and water-pressure pipes, &c. Again, the lode consisting almost entirely of very hard crystallised spar, was thoroughly honeycombed with "rugs," many of them 3 ft. long and 10 in. wide, so that as many as three and four holes have had to be abandoned after being a good depth. At the lowest calculation the lode has retarded our progress 3 ft. in 9 ft. The portion of country rock also which we carried, being so closely associated with the lode, was intimately mixed with strings of hard quartz, and was tedious for boring.

Immediately above Mr. King's letter some information is given by Messrs. John Taylor and Sons of operations at the Halkyn Tunnel, the maximum speed being 87 yards in one month. In this case four powerful machines are employed, and as many men as can possibly get to work, and everything apparently sacrificed to speed. With two small machines in the unhomogeneous ground described, and with a small party of men, we accomplished 10 yards in one week; and I am quite sure if, regardless of expense, we had worked four machines with a proportionate increase of hands we should not have fallen below the highest speed attained in the Halkyn Tunnel, highly creditable as that is. Our increased experience of the Darlington valveless borers fully confirms our previous testimony of their worth. Rushen Mines, Isle of Man, March 4. JOHN BARKELL.

THE NEW PATENT BILL.

SIR,—The new Patent Bill introduced into Parliament last week has just been published, and the following are its principal provisions:—

- 1.—The duration of provisional protection is to be extended from six months to one year, and the stamp duties thereon lowered to half their present amount.
- 2.—A complete specification must, however, be filed before the expiration of nine months from date of original application, or the protection will terminate at the end of the twelve months, and cannot afterwards be renewed.
- 3.—The complete specification shall be immediately published, with all other documents relating to the case, and for a prescribed period anyone shall be at liberty to oppose the grant of a patent.
- 4.—If there be no opposition the applicant may give notice to proceed, and secure his patent for half the stamp duties now levied.
- 5.—A patent shall last for 21 years instead of 14, but shall become void if the 50*l.* and 100*l.* stamps be not duly paid at the end of the third and seventh years respectively, and an additional stamp of 100*l.* before the end of the twelfth year.
- 6.—Patents can be amended or added to hereafter, but with such fees and limitations as to make an amendment—especially if an addition—almost as costly as an original patent. The amendment, however, then becoming part of the original patent is not subject to additional stamp duties. (This, however, is still a great improvement over existing practice, and all alterations mentioned so far are in favour of the patentee.)
- 7.—The Crown shall have power to use any patented invention, paying the inventor such royalty as the Treasury shall consider fair.
- 8.—If an inventor do not work his invention in the country within three years of grant, and if he refuses to grant licenses on such terms as the Lord Chancellor shall consider reasonable, the patent will be annulled.
- 9.—Inventions first patented (or imported from) abroad can in future be patented in England by the foreign patentee (he being the true and first inventor) within six months of the date of the foreign patent, or of the date of this Act. But such patent will fall with the expiration of any foreign patent for the same invention, whether granted before or after date of such patent.
- 10.—The Lord Chancellor shall have power in certain cases to allow a patentee, who has accidentally omitted to pay his tax in time, to pay it within three months after it became due, and thereby save his patent.
- 11.—All patents applied for before the passing of the Act to be independent of all its provisions except article 10.
- 12.—The modes of procedure are altered in many respects, interesting only to patent agents and lawyers.

This Bill is decidedly a step in the right direction, though it has

faults that will probably be rectified in committee, and it is earnestly to be hoped that it will not share the fate of its less promising predecessors introduced by the present Government in previous sessions.

WM. P. THOMPSON, AND CO.,
Solicitors of Patents.

High Holborn, London, and Lord street, Liverpool, March 3.

FREE TRADE.

SIR.—A few weeks since you admitted into the Journal a letter upon the subject of Free Trade. This subject is just now so much discussed, and obviously so very little understood, that perhaps you will allow me to ask some advocate of that policy to explain how free trade is to benefit England if other nations, by means of protective duties, practically exclude British goods from their markets? For instance, we will suppose that the Russians can supply us with corn, the Americans with beef and cotton goods, the Germans with hardware, and the French with silks at a cheaper rate than these things can be manufactured in England. In what way does England as a nation benefit under such a state of circumstances?

It is obvious that all our farmers, cotton spinners, &c., would be ruined, and that large sums of money must leave the country in order to pay for these imported articles. It seems to me that England must, under such a state of things, speedily become as poor as she is now rich; but free-traders speak so confidently of the advantages of their system that I suppose I must have overlooked some point which makes all the difference in the argument. I shall, however, be very glad to be set right.

March 6.

MINING IN THE CHANNEL ISLANDS.

SIR.—When on a tour in the Channel Islands last autumn I spent a day at Sark, and there found the ruins of an old mine, about which I could get little or no information. All the natives could or would tell me was that it was a silver mine, had been worked about 30 years ago, and was stopped owing to the loss of the vessel carrying the first cargo of ore. As it is evident that a considerable amount of work has been done, and as the country around shows strong signs of mineral action, I should feel greatly obliged if some one of your numerous readers will give me a brief history of the mine.

March 5.

CURIOSITY.

WELSH GRANITE QUARRIES.

SIR.—Wishing to invest 4000*l.*, my attention was attracted by an article in the Journal some months ago recommending the shores of Carnarvonshire as a profitable field for investment. But while the prospect held out as brilliant as could be desired, the letter was signed "Quarry Proprietor," which struck me as being a little unusual, for owners as a rule do not urgently invite competition in their own trades. Later on I fell in with the prospectus of a quarry for sale for a very small price in the immediate district. Anything more alluring than this prospectus could hardly be conceived—large profits were to be made at once, and "cent. per cent." in a very short time; while the operations of the Welsh Granite Company, with the profits they were "said" to be making, were freely alluded to. In the present day the difficulty of investing money with safety and a good return is well known; so I thought I would spend a week in the district, and see for myself, and judge for myself, of the probability of cent. per cent. I did so, and as I knew some of my friends, likewise seeking investments, would be influenced by my visit and opinion, I took some trouble about the matter. I came away with the conviction that I had better not invest, and I purpose now to give you my reasons, because in your January and February numbers further letters appear from various correspondents, all writing up this district, and in one of them the writer lays some figures before your readers to interest them, and further says that 150,000*l.* may be safely invested here, with a probability, if not a certainty, of 50 per cent. I beg also for space to lay before your readers the history of my search for an investment in North Wales, and as I have arrived at very different conclusions from your other correspondents, the comparison of our views will at least be curious, and may be interesting.

As the name of the Welsh Granite Company was so freely used I thought it advisable to provide myself with an introduction to the manager (to whom I was an entire stranger) to use in case of need. I arrived then in the district, and spent an entire week there, walking along the tops of the hills from Porthdynllaen to Clynog, and I think I saw every quarry and abandoned quarry in the place. It appeared to me that there is only one fully developed quarry here—the Eifl Quarry of the Welsh Granite Company. This company has also a smaller quarry undeveloped, with no shipping place or inclines, at Gwyllyr, six miles off; and I was told that this was practically closed for six months in the year, on account of the difficulty in inducing ships to come in the winter. There is another large quarry fully developed at Nant, called Port Nant. Why Port is not clear, as it appeared to me an ironbound dangerous place, entirely open to the sea, without any shelter that I could discover. All the rest I saw seemed mere surface openings, or openings abandoned many years ago, and all of these I thought together occupied less space than even the smaller quarry of the Welsh Granite Company. I did not make much out of the exploring of the quarries unaided, I thought, therefore, I would get help from some practical men; and it occurred to me that a sett-maker would give me much information of a practical nature, and so he did. He told me that the Welsh Granite Company had commenced at their smaller quarry at Nevin very many years ago, but were obliged to look elsewhere; owing to the coast being open to the south-west, west, and north-west gales ships could not, and would not, take the beach during the winter, and that there was a great quantity of debris in the quarry. That they had examined every hill and site they could find, and had eventually settled on their present Eifl Quarries, which were the best in the district, producing hardly any dirt and small stone, and were sheltered for ships. As to the other quarries, he said the Welsh Granite Company had the little opening at Tynawr, and were compelled to abandon it through an insufficient quantity of stone, and an ironbound coast open to the west; and that he believed they had opened and abandoned Pistyll in the same way; and that the other quarries were abandoned in the district because the proportion of dirt and small stuff to be moved had swamped the small quantity they made, and the fact of their being open to the sea. That was his opinion. He further said that the quarrymen and miners of course liked new company's openings, as it kept up the wages, and as such men were scarce he could readily get work in any quarry he chose. My hopes of cent. per cent. had now dwindled down to 50 per cent.

I then at Nevin got into conversation with one of the captains of the coasting schooners, and the substance of what he told me was that all the way from Carnarvon bar, or Clynog, to Porthdynllaen it was an ironbound coast, very dangerous for vessels, so that none of the local insurance clubs would cover any risk of vessels going to these quarries; that, with the exception of the Welsh Granite Company, he considered they were all, all but unapproachable in the winter, or in any but smooth fine weather; and in many places with a very bad bottom, and that at Port Nant they were obliged to work by steamers, and that these were often a week at a time and more at Porthdynllaen, four miles off, before they dare venture to go and snatch a cargo; and he thought the only place in the district where a vessel could lie and wait her turn was at the pier of the Welsh Granite Company, who had taken advantage of the Trwyn-y-tal point, and at an enormous outlay had had to run out a breakwater there, which protected their place to the west and to the north, and that he thought it was the only place possible for ships all along the coast; but even there the insurance company had given ships notice they would refuse the risk if vessels were injured there, and that ships there were sometimes a month to six weeks at a time waiting their turn. My hopes of 50 per cent. had now undergone a further reduction, for with even existing quarries competing for labour in a thinly populated district, with no houses or accommodation for men handy, the nearest railway stations seven miles off, along a very bad road, and uncertain and dangerous shipping places, constructed at great outlay, and occupying much time to construct, risks refused by insurance companies, and all but

unapproachable in the winter, meant uncertain deliveries and intermittent traffic, and with occasion loss.

There was another point I wanted to clear up—if there were these valuable properties lying all these years so near the Welsh Granite Company's quarries, which had been so long in this district, why in the name of common sense had they not secured them long ago? With the view to clear this point, and to get what other information I could, I called on the manager of the Welsh Granite Company. He told me at once that if I were in any way connected with any of these what he called "mushroom" quarries that he would render me no assistance whatever, as he said that they were simply ruining the market by adding to the fierce competition already existing, and that they kept up the wages of the men to an extreme point; but there was one good thing he thought, that with this and the excessive outlay they would have to undergo they were of necessity cutting each others' throats as well, and that they would soon find it out. I assured him I was quite unconnected with any of them, and was sincerely seeking an investment of 4000*l.* at a good rate of interest, with as much safety as possible; showed him the prospectus I had brought, and asked him why he had not secured this so called valuable property. He was very much amused, as he had not seen the prospectus before. He said to get a tacknote and way leaves cost but a trifle, that a prospectus was very easy to write, but if prospectuses did not promise a great deal no shareholders could be got, and that many had very elastic imaginations.

"I will now tell you," said he, "how we find the trade. In the first place it is already a fiercely competing trade, the supply is quite equal to the demand, every order is keenly fought over, and profits, therefore, reduced to a minimum. I will prove this by pointing out. If you go north you are confronted by the great quarries at Bondive supplying Glasgow and the district; also you are confronted by Shap and Dalbeattie. If you go Liverpool way you are kept quite in order by the two large Penmaenmawr quarries and Cleve Hill. If you go to Ireland you are met by the Newry quarries. If you go south you are met by the Cleve Hill, and if you go further south you are met by extensive Cornish quarries. If you go along the south coast you are faced by the Guernsey quarries. If you go to London you are confronted by the huge quarries at Aberdeen. Mount Sorrel and Quenast in Belgium and Guernsey. Wherever you go you find people ready to control and fight your prices, and I recommend any intending investor to verify this statement for himself. So much is this the case that we have just lost an order for a very large corporation, and have lost it by 1*d.* per ton, the profit on it being 10*d.* per ton." What, I said, do you say 10*d.* per ton? Look at this prospectus. It appears to give accurate details of cost, and shows from 7*s.* to 9*s.* per ton. Here he laughed heartily, and produced a number of prospectuses of many companies, and selected one in which a similar great profit was promised, and in which an apparently careful estimate of cost had been prepared. He then said that both those estimates, though seemingly written with the greatest knowledge of the subject, and with the utmost assurance, are wrong, and must, in his opinion, have been written by men who could have had but little real practical knowledge, and had a great deal to learn of the subject on which they profess to guide others. Judge for yourself. Compare the two. One puts down cost of management, incidentals, and wear and tear at about 6*d.* per ton. Now, these items must include, of course, salaries, agents, commissions, law expenses, travelling and expenses of all kinds, wear and tear to rolling stock, plant, inclines, rails, chains, drums, and gear of all kinds. The other considers that about 2*s.* 4*d.* per ton will cover the same charges. One leaves out wear and tear altogether, but puts in loading up the sets and discharging into vessels at 10*d.* per ton, besides transit over inclines at 8*d.* per ton, the whole of which the other merges in an estimate of 6*d.* per ton. Both cannot be right. "In truth," he said, "both are estimates by people who must be, in my opinion, quite innocent of any real knowledge of the subject on which they write, and that they are both hopelessly wrong. Unless they have arranged with beneficent Nature to suspend her usual operations in their favour, unless they propose to scratch up the stones with their fingers, and can ignore poundage and other charges, I should say their estimates have omitted charges of from 6*s.* to 9*s.* per ton, which charges must and will force themselves on their notices in an unmistakable way."

One other point I wanted to clear up, and that was about the opening of the other quarries. He said "We have opened one or two ourselves some years ago, but all of them have been offered to us over and over again. We used to work Tynawr, resuscitated lately by a Carnarvon Bay Granite Company, which we were compelled to abandon 10 years ago. They have repeated our experiment it seems, and after going through various vicissitudes (we bought some of their plant) it was advertised for sale by auction in last September. I further draw your attention," he said, "to the advertisement in the Liverpool Mercury of Oct. 2, in which two 'very valuable' Welsh granite quarries, immediately adjoining those of the Great Welsh Granite Company's Quarries are offered for sale on very easy terms. What does this look like? When a mine of wealth is offered for sale in this way. As to your enquiry about the particular quarry you mention as in the Carnarvon Bay district, it has been in the market any time these 10 years. It was offered me for a very small sum twice by a Manchester firm, and once by a Liverpool firm. I have often examined it, and the conclusion at which not only I but our foremen and two of our best rockmen always arrived was the same, as I believe the rock is everywhere too much cut up by natural beds and joints in cooling to yield a profit, and the proportion of small stuff and earth will utterly swamp the sets made, apart from its being opened to the sea, and bad for shipping, that is why, although we might have had it any time these 10 years, we preferred to leave the experiment to be tried by others, if any could be found hardy enough to try it."

My hopes, Mr. Editor, of a certain profit had vanished, and instead of having alighted on a Tom Tiddler's ground, where you had nothing to do but pick up gold and silver, I had discovered, I thought, but an ordinary business place, not yielding a very large profit, but a very small one, and a keenly-contested business too. I do not impugn for one second the good faith of anyone of your correspondents, and have no doubt they believe in the statements in their letters; but after what I have seen for myself I can have but little faith in their knowledge of the subject, or of their research, and can hardly see how they can assume the leadership of others, and have taken some little pains to lay my little experience before you, thinking your readers may desire to consider both sides of the question, and to set myself right with any friends who may have been influenced by my opinion, and who may see the letters. I do not know any of your correspondents, or have I ever seen any of them to my knowledge, but as an illustration, observe what Mr. Spargo says in his letter of Jan. 25 (and I take his letter more especially as he is the only one who writes publishing his name, and because he gives more particulars than others). He goes it seems to well-known sources, and gets the amount of granite annually consumed in London, which is, of course, very large. He sees the Carnarvon Bay Quarries, and the sight so works on his enthusiastic nature that he, as it were, bursts out with song, and exclaims—"Ah, the Carnarvon Bay district quarry proprietors have a future before them that should make them regret their age, however young they may be." Surely he cannot be ignorant of the fact of the existence of the great Guernsey and Aberdeen quarries, which have supplied this demand for the last fifty years; and yet how could they have escaped his memory. He may not know, perhaps, or have taken the trouble to ascertain, as I did, that freights from Guernsey have been as low as 4*s.* 9*d.* per ton to London, while the lowest freight from Carnarvon district is 10*s.* or 11*s.* Then, with regard to Manchester and Liverpool district, Mr. Spargo surely must have forgotten the existence of the large Penmaenmawr Quarries, which are 2*s.* a ton nearer by sea than these quarries, and have also the railway running right through their quarries. Where, then, is the bright future for these Carnarvon Bay district granite quarries? After my visit I confess I do not see the splendid prospects predicted by your correspondents, but I see a fiercely competing future even after expending large sums of money on necessary works,

occupying much time, with tremendous obstacles to fight against and great risk, and this is my opinion after a *bona fide* search for an investment, and I, therefore, thought it more prudent to keep my money in my pocket than trust it in this locality.

ANOTHER VISITOR TO CARNARVON BAY DISTRICT,
AND WOULD-BE INVESTOR OF £4000.

WELSH GRANITE QUARRIES.

SIR.—On more strict enquiry as to the number of actual sett makers employed at the well-conducted Welsh Granite Company's quarries, I beg to inform you that so far as I can ascertain the number should not be set down at 400, as named by me in my letter of the 6th ult., as I am now informed that they are nearer one-half that number. I am, therefore, anxious to correct the error.

March 6.

EDMUND SPARGO.

THE CAMBRIAN MINING COMPANY.

SIR.—It is no part of my duty, as managing director of this company, to answer the questions of anonymous newspaper correspondents. But I must request that you allow me to deny, *in toto*, the suggestions contained in last week's Journal, and to say that I shall not in future condescend to notice any such remarks.

London, March 5.

GEO. H. KEENE, Managing Director.

THE CAMBRIAN MINES.

SIR.—Your correspondent from North Wales, Salop, and Cardigan, writing on Feb. 27, says he has no interest in these mines, and that his remarks are perfectly genuine, and without personal feeling or object. The fact is some one has been telling him a perfect tissue of nonsense, which he seems to swallow as gospel. Having had something to do with the purchase and sale of these mines, I can answer his questions, which I do not suppose Mr. Keene or any other gentleman would do to gratify persons whose sole object is to damage the interests of the shareholders and those connected with this property. First, then, were the mines or one of them bought in the early part of the year in which the company was formed by a Cardigan tradesman for a sum not exceeding 500*l.*? No.—Second, Did not this purchaser sell them in March, April, or May of the same year for a sum not exceeding 1000*l.* to the vendor of the company? No, nor at no other date.—Third, As to the quantity of ground laid bare before the sale to the present company for 70,000*l.* I am not prepared to state, but I can aver the finest discovery ever made for many years in this county had been found in sinking the engine-shaft previous to this transaction.—Fourthly, I would not answer if I could, and I am sure Mr. Keene will not, as none but shareholders, and not a lot of meddlers, have a right to get the information; and the fifth question is, if possible, more impudent and absurd than the other four.

Goginan, March 4.

ABSALOM FRANCIS.

MINING IN CARDIGANSHIRE.

SIR.—Your correspondent, "Miner," is in error as to my not holding a pennyworth of interest in mines in this county, and also as to my wishing to run down Cardiganshire mines, as I have sunk upwards of 5000*l.* in mines in the county, never having disposed of a portion of my interests; and I have every reason to believe that with a better price for lead I shall have no reasons to regret my investments. Of course, "one does not expect every egg to hold a chicken."—March 6.

G. J.

PENSTRUTHAL MINE, AND ITS PROSPECTS.

SIR.—I have often thought what a pity, and wondered how this mine has been allowed to be trifled with for such a long time, and never more than at present. The mine presents every prospect of a great success, and with good management and a further small sum expended judiciously, might be properly developed. The sett is principally virgin ground, and the numerous lodes running through it are generally rich, and as far as has been seen have the appearance of permanency. As it is, with about half-a-dozen men working, with the very unproportionate cost of the machinery in use, drawing engine, &c., the property by these few men yields a sufficient quantity of ore to meet nearly the whole cost. Of course, the expense of the engine, &c., is the same as if 100 men were at work, so why do not the company call up additional capital (as apparently from their proceedings they lack this vitality), and thus give the sett a fair trial, and make an early return to the shareholders for their outlay most probable, instead of wasting time and money as now, and doing good to none excepting the officials. Perhaps more money cannot be had as the matter rests at present. The shareholders, knowing the position they occupy, are alive to their situation, knowing they have no legal holding of the property, the vendor not having been paid for the sett, in addition to which the company have not even an assignment to them of the mine, thus leaving to the lessee the power of stepping into their shoes at any moment. Then why do not the ones in possession make some arrangement with the vendor, who is the lessee? And when on a right footing I have no doubt but an abundance of capital could be raised without trouble. As it now stands, the directors can hardly expect to raise money on a property with a debt on it of 6000*l.*, owing, I understand, to the vendor. From the copy of the agreement made between the vendor and the company, all the vendor has received is 100 shares, and the dividends on the 2000 he was to have, and nothing of the 2000*l.* cash that is due to him. I hope the directors and shareholders will give the subject their earnest and immediate attention for their own sakes—besides, I believe, the property not being assigned to them is sufficient, if acted upon, to put the company to great expense, independent of the vendor's claim, which should be compromised or settled in some way at once.—March 5.

J. E.

IS IT RIGHT TO PAY ANY PURCHASE MONEY FOR MINES?

SIR.—Pending the revelation of "Actuary's" name, so that I may reply to his letter, I may make one or two remarks. The amount to be paid for a mine depends upon its character and prospects. I know an ironmaster who took a royalty which was supposed to be practically exhausted by the former lessees. No special payment was made, as he leased the royalty direct on the retirement of the preceding lessees. He has, however, been highly successful in developing the resources of the royalty, and has now half a million tons of splendid hematite ore bared and proved, and there is a certainty of proving another half million tons. At present of course the price of hematite ore is very low, and therefore the value of the mine is at its minimum; but if in the course of a year or so the price of ore goes up, say, to 20*s.* per ton, the profit on this million tons of ore would be, in round numbers, five hundred thousand pounds. Supposing this royalty was then offered for sale to a purchaser or to a company, every reader must see that a very high price would be asked and readily paid for it. Precisely analogous to the case of a mining company whose shares have been standing at par. A great find is made, and the shares go up, say, 100 per cent. Any argument upon such cases appears superfluous. The great point for purchasers to observe is what, under all the circumstances of any mine—existing, probable, or contingent—is a proper price to pay, whether it be 1000*l.* or 50,000*l.* In estimating the price to be paid for any valuable mine very many elements have to be taken into account by those experienced in such matters; and it is impossible to lay down hard and fast lines applicable to mines generally. Each has to be judged of by its own special features. Never was there a time more favourable for purchasing good mines than the present. Not only is trade bad, and the price of all minerals low (I hope at the lowest point), so that the actual value of any mineral at the present time is a very advantageous element to a purchaser in purchasing a mine. Profits are small, so that in estimating the value of a mine, and including in that estimate an improved price hereafter, and of course larger profits, the final adjustment of value tells much more in favour of a purchaser than if he were dealing with a mine in a time of prosperity. In prosperous times we cannot contemplate adverse influences with the same feeling we can in bad times. It is to be hoped that some capitalists will have largely taken advantage of the present state of things, and bought

many royalties and mines. They will reap a rich harvest when the "good time coming" arrives, as it is sure to do.

March 6.

WILLIAM SALMON.

A RETROSPECT.

SIR,—Fifty-two years ago this month I went to live at Gwennap, when nearly all the mines in that parish were at the acme of prosperity, except Wheal Squire, which was idle, as it has been ever since. Since that date time has made great changes in all things. Nearly all the mines are abandoned, and all the agents who were concerned in them are numbered with the dead. The only mines now at work are Cornford (a promising copper mine), Bell adjoining Penstruthal adjoining Bell, and one or two other small concerns. It is understood that some large works will be undertaken shortly at Clifford Amalgamated in the treatment of the heaps of debris there, which contain copper, tin, silver, and mundaie, as per assays taken. In the year 1827 the agents at Poldice and Wheal Unity were the following:—Capt. Josiah Harvey, of Whitehall, Scorrier, who was the sleeping manager; Mr. Wm. Sims, late of Whitehall, was the engineer, assisted by his son, Josiah, a mechanic, who afterwards settled at Tavistock; Capt. Henry Tregoning (deceased), Mr. Thomas Simmons, of Killigannon (late deceased), and Mr. Edward Williams, late of Cosgarne (deceased), were the accountants. The agents were Capt. Ambrose Bray ("short"), Capt. Ambrose Bray ("long"), Capt. John Reed, J. Bargwanna, R. Magor, John Barnett, and Annear. Capt. Wm. Bailey was the tin assayer. All those persons have long since departed this life. At Wheal Gorland Capt. Philip Richards was the agent, and Jonathan Bowden, who died last week at St. Day, was the smith. Richards was killed by falling down a shaft, owing to the breaking of a board which crossed it. This mine has been idle 20 years or more.

At Wheal Unity Wood Capt. Nicholas Treweek, of Cosgarne, was the agent. He was succeeded by Capt. John Kernick (both deceased), the former about 46 years ago, and the latter 15 years. This mine ceased about 20 years ago, or more; but between the period of Treweek's agency and the last cessation there was a re-working by the same company. At the Consolidated Mines the headman under Messrs. Taylor was Capt. Wm. Davey and Capt. Wm. Francis; next Capt. John Richards, next Capt. Wm. Davey, of Tolearne. The under agents I do not remember, but I remember that Capt. Manuelli was the surface agent about the ore dressing, and that a Capt. Hosking (an agent) was residing at Wheal Fortune section of the sett. All the persons concerned died long ago, except Capt. John Richards, who died only a few years ago at Trefula. The last engineers, Hocking and Son, are still alive. They succeeded Mr. Woolf, the original engineer under the company.

The Consols leases to Messrs. Taylor were granted in 1819 for 21 years. In the year 1836 or 1837 those gentlemen, having realised very large profits, were desirous of securing a fresh term, but on applying to the agent of the principal lord they found that a fresh lease could not be obtained. The Messrs. Williams, seeing this, acquired the mine engines and materials at 100,000*l.*, and they worked the mine a few years, but lost by the purchase, it is said, a considerable sum. All the Messrs. Williams are off life's stage. I know of only one man now living, except myself, who was present at the first meeting of the Consols Company, held on Oct. 19, 1819, and that is Mr. R. Davey, of Bochym, near Helston. His brother, the late Mr. Stephen Davey, who also attended the meeting, died about 12 years ago. Their father, Capt. Wm. Davey, died in 1827; he commenced life as a bumble boy at 2*s.* 6*d.* per month, but he left a large property, it is said, to his sons, who by subsequent success in East Wheal Rose, Wheal Buller, &c., have largely increased it. About the year 1830 Messrs. Davey purchased from Sir C. Hawkins's representatives the manor of Mithian, in St. Agnes, which 100 years previously was vested in the Mohun family; they also purchased the Duchy manor of Tywarthaile and sundry other lands, including Bochym, which is a large and highly cultivated farm, in hand.

No persons connected with Cornish mining made so much money by that pursuit as the late Mr. John Williams, of Scorrier, and his sons, Messrs. John, Michael, and William. Mr. John Williams's father, who died, perhaps, 100 years ago, was a successful miner to some extent, for he bequeathed to his son Michael 17,000*l.*, but to John only 1000*l.* Michael spent his legacy by living on a scale somewhat too large at Trefula, in Redruth, but John carefully employed his, became very rich, and assisted his brother Michael and family. Michael, the eldest son of Michael, died in Swansea, where he was manager of the copper works; Charles was appointed sampler under the copper company, and John was made a clerk at mines—all deceased. I think that the height of the prosperity of Messrs. Williams was at the time of Mr. Michael Williams's death (I mean the last Mr. Michael) in 1859; after that his brother William (the late Sir William) lost a great deal of money in unproductive mining in Poldice, United Mines, Pannance Consols, and other things, so that so far as that branch of Mr. J. Williams's family is concerned there has been a retrogradation in wealth; but, nevertheless, Sir William's personal estate was about 300,000*l.*, and his Devon estates yielded and still yield about 10,000*l.* per annum, whereas his son the late Sir Frederick Williams's personal estate is sworn under 180,000*l.*, and he overruled at the Cornish Bank 60,000*l.*, which shows a decrease in wealth. The bulk of the estate of Mr. Michael Williams, as also that of his brother John, of Burncoose, were devised to Mr. John Michael Williams, of Pengreep and Carhayes Castle. Mr. Michael's eldest son, so far from diminishing the value of the estates, has since purchased lands of the value of 700,000*l.*, or more, so that he is one of the richest gentlemen in Cornwall; he is, I believe, the sole proprietor of the copper smelting works at Swansea (late Williams, Foster, and Co.), and of the West Cornwall Bank at Redruth; he has given up Cornish mining, having enough in hand besides; he lost a few thousands in Clifford Amalgamated and Poldice. Poldice for nearly 50 years was a losing concern. Pannance Mine, worked 20 or 30 years, was always poor; the work for many years was mere adit work. There was an engine set up only a few years before the mine ceased to be worked, so that the mining under adit was very limited. Wheal Damsel yielded Messrs. Williams and Co. about 200,000*l.* profit. The late Capt. T. Kitto was agent here; one of the most industrious and confidential agents the Messrs. Williams ever had; he dialled the mine, and laid down the levels apart so as to make the plan serve also as a section; I call it a sectional plan. The clerk there was Capt. A. Skewes, who died in 1835; his son Alexander (usually called "Elec") was the chief clerk at Burncoose Copper Office, and highly prized by Mr. J. Williams and Mr. J. M. Williams for his strict integrity and diligent attention to business. Wheal Damsel ceased about the year 1830, but Capt. R. Pryor formed a company, which worked it a short time about 12 years ago. The first copper office of Messrs. Williams and Co. was at Wheal Damsel account-house, the present office at Burncoose being erected about the year 1829, 50 years ago. Mr. R. Bain, who died lately in London, was one of the clerks, a very studious and scientific bachelor; he is one of the few bachelors who died rich. Mr. R. Cliff, who was a travelling clerk under C. and J. Harvey, St. Day, is the husband of a second wife, and has a family; he is rich, but a bachelor who held a similar post in the same office had to be put into the Union; he is now subsisting on the liberality of his friends, who took pity on him.

Messrs. C. and J. Harvey having been brothers-in-law to the late Mr. J. Williams, of Scorrier, had his influence in securing business to his shop and stores; he supplied the numerous mines in Cornwall, of which Messrs. Williams were managers, with iron, steel, leather, grease, timber, stoneware, &c., and he also supplied the labourers of every kind with flour, clothes, groceries, &c., and on pay days deducted the amounts from their wages. Mr. C. Harvey left an only son, Richard, with about 500,000*l.*, with 300,000*l.* of which he purchased extensive estates in Devonshire, which (having no issue) he devised to Mr. P. P. Smith, of Truro, in reversion to Messrs. Harvey, who has a life interest in it. Mrs. P. P. Smith had a legacy of 20,000*l.*, and her eldest son 5000*l.* Mr. J. Harvey's estate devolved to an only daughter, who married a Mr. Andrew. I forgot to say that Mrs. J. Williams, of Scorrier, died in 1827. In 1829, when he was about 75 years old, Mr. Williams married a girl aged 25 years, and settled an annuity of 300*l.* per annum on her for life. Mr. Williams died about the year 1837, but his widow soon married again, but is now a widow, I think, for the third time; she is enjoy-

ing still the 300*l.* a year. Mr. Williams died at Sandhill, near Gun-nislake; he was a good man, and so was his son John, a quaker.

The Messrs. Williams who worked East Wheal Damsel thought they would try the effect of a cross-cut thence into a sett they had close by, called Wheal Jewell, in St. Day Manor; it intersected a copper ore lode, which, with other lodes cut afterwards, yielded about 300,000*l.* profit. I think about two-thirds of that sum went into Messrs. Williams's purse. In 1822, when I first visited the United Mines, they were in the hands of Messrs. Williams and Co., but there was always a loss; they sold them afterwards to Messrs. Taylor and Co., who were working the Consols at the time. After a few years the Messrs. Williams and Co., who had a rich mine in Wheal Clifford, bought them back from Messrs. Taylor, and after awhile amalgamated them with Clifford, and worked them a few years under the style of Clifford Amalgamated Mines. The Messrs. Williams worked Wheal Maid, adjoining Consols, for many years, but with no great success. The agents here were Capt. R. Sampson, W. Tregoning, and Raby, with Mr. J. Williams, clerk, all deceased. Messrs. Williams also worked Wheal Friendship (since called Wheal Andrew) and Nangiles under the name of Union Mines. The motive power for pumping was supplied by two powerful water-wheels turned by the water of the great Gwennap adit, a level for the discharge of which was taken up at Carnon. Messrs. Williams also worked Treskerby, from which great profit was derived. I think that Capt. W. Teague was the manager here, a relative, perhaps, of the celebrated Capt. Teague, of Tincroft. This mine stopped in 1823. Wheal Unity and Poldice were worked in conjunction by Messrs. Williams; they also worked Wheal Clinton, near Scorrier, and Wheal Pink, close by it, both poor. Mr. Michael Williams had a large interest in Tresavean during its prosperity; they also worked Carharrack, but the mines they had out of Gwennap are too numerous to mention; they profited about 90,000*l.* by Godolphin Mine, in Breage, which they opened about the year 1800. Those who followed lost 150,000*l.* There are very few men now living in Gwennap who were there in 1827. My old friend, Jonathan Bawden, of St. Day, died a few days ago, aged 77; he could tell more about the people of Gwennap than anyone else that I knew. St. Day, once a place of great business, has almost become "a deserted village"—at least it is partially so—several public houses shut up, old houses vacated, and almost tumbling down, as in other villages, hamlets, and isolated dwellings in the district. The like may be said of all other Cornish mining districts. We live in distressing times—we are in adversity in Cornwall.

Feb. 28.

MINING AND BANKING IN CORNWALL.

SIR,—The collapse of two old and respected banks in Cornwall gives rise to the thought whether the relation between mines and bankers in the Stannaries district is precisely what it ought to be; and also whether the system cannot be changed with great advantage to miners and to mine adventures likewise. It has ever been the bane of Cornish mining that it has been conducted on credit, so that the adventurers have always been in the hands of merchants, who have not only charged them a large percentage upon the proper market price because of such adventurers' helplessness, but because they themselves have frequently been compelled to incur obligations from their bankers. Now, it may safely be estimated that the merchant cannot obtain accommodation from his banker at less than 5 per cent., and to cover this he usually charges the miner 15 per cent. excess. Coals which could be bought at 13*s.* for cash are charged 16*s.* on credit, and it is the same with every other material taken on the mine. I believe that seven-eighths of the Cornish mines which are now failing to pay cost would upon the ready money system be able to return dividends. The Cornish banks and Cornish merchants should be ignored by adventurers, who should purchase direct from the producer or manufacturer for ready money.

Take, for example, this new limited Cornish Bank, which is to take over the business of one or more of the bankrupt concerns which have recently been noticed. Here one of the principal promoters, who is said to have long been overdrawn at his bankers, is a merchant, and it is rumoured that he is going to pay for his shares by bills having some months to run. This ought not to be permitted; a bank thus floated cannot be strong, and the encouragement of it does but enable the merchants who may be in league with it to go on victimising the adventurers by charging them more than the market price (and, perhaps, necessarily so to cover their own risk) for everything the mine requires. Let every mine company avail itself of the new Stannaries Act to make calls for the ensuing three months, and they will have no 13*s.* interest on coal bills, as charged at the Penhalls and Blue Hills meetings, and their working cost will be 20 per cent. less without reducing the miners' wages a penny per month. If this be done the list of dividend-paying mines in Cornwall will be much increased, and everybody will be satisfied.

St. Agnes, March 3.

CASH.

CORNISH MINING, AND ITS PROSPECTS.

SIR,—No time in the annals of mining has shown a more favourable opportunity for the investor than the present. That the time has arrived for making a selection of stock is evident from the fact of a reaction having set in in the price of metals. Suffice it to say, the animation already visible in the tin trade has enhanced the market value of some six mines in the short space of four weeks 70,000*l.* The writer is pleased to say that another such number of mines must in an equally short space of time have a similar if not a greater rise, such prediction being founded on recent inspection, improvements and discoveries fully warranting it. Notwithstanding the improved tone and general desire on the part of the public to avail themselves of the lowest ebb, there are, strange to say, throughout the county properties presenting prospects of early dividends selling for about the value of their plant. About three months ago one of such mines stood in the market at about 3000*l.*, with a plant double that amount; to-day the shares are eagerly sought after at an aggregate value of 24,000*l.*, thus amply repaying those who stuck to the mine through its adversity.

Cornwall, March 7.

CHAS. BAWDEN.

[For remainder of Original Correspondence, see to-day's Journal.]

FIRELESS LOCOMOTIVE FOR TRAMWAYS.*

At a recent meeting of the French Association for the Advancement of Science, M. Franque stated that in the tramway engines on his system, regularly employed on the Marly line, the reservoir, constructed of steel plates, holds 64 cubic feet of water, which may fall from a pressure of fifteen atmospheres to that of three atmospheres. The steam is wiredrawn so as to enter the cylinder at a suitable pressure. The steam is exhausted into a tubular air-surface condenser, which retains a part of the steam, and suppresses the noise of the exhaust. Theory, he argues, shows that the best performance is obtained when the steam is wiredrawn to a pressure of three or four atmospheres. Each pound of water, between fourteen and two atmospheres, is capable of yielding a useful work of 5900 ft. pounds. The consumption of coal amounts to 5.81 lbs. per estimated horse-power per hour. M. Franque estimates the daily cost of a fireless locomotive at about half the cost of an ordinary locomotive.

—By M. FRANQUE: *Annales Industrielles*.

* From JAMES FORREST'S "Abstracts of Papers in Foreign Transactions and Periodicals," for the Proceedings of the Institution of Civil Engineers.

PURIFYING ZINC SALTS.—Both the chloride of zinc and sulphate of zinc as produced in various processes frequently contain foreign metals, such as iron, lead, manganese, cobalt, nickel, and copper, either severally or mixed. For certain purposes in which salts of zinc may be employed, the presence of these foreign metals may be objectionable. They can according to Mr. F. M. LYTE, of Savile-row, be conveniently abstracted from the zinc chloride or sulphate by adding to the solution of the same an alkaline or earthy hypochlorite, such as hypochlorite of soda, or bleaching powder, or a solution of hypochlorite of zinc may be employed for the same purpose. The zinc solution should by preference be made completely neutral before the hypochlorite is added, and the addition of chalk or any alkali or alkaline earth or zinc oxide promotes the precipitation of the per-

oxides formed. It will also accelerate the precipitation to heat the solution after adding the hypochlorite.

THE ANTIQUITY OF COPPER MINING IN CORNWALL AND DEVONSHIRE.

The German chemist, Beecher, who resided for many years in Cornwall, and took an active interest in mining operations, has not inappropriately termed the West of England the Mining School; and, indeed, the rugged irregular peninsula forming the south-west portion of our island may be described as one huge mass of metaliferous deposit. A line drawn from the north coast of Cornwall, a few miles east of Tintagel to the neighbourhood of Exeter,* would roughly divide from the rest of our island that portion of the western peninsula in which the most important metallic deposits have been found. It is said that westward of such a line almost every known metal has been traced, but it is chiefly to the vast abundance in which the ores of tin and copper have been and are mined in Cornwall and Devonshire, and to the former of the two metals being found in no other part of the British Isles, that the two counties owe their importance as a mining district; and doubtless the tin-raising industry in the West of England can claim an earlier origin than any similar enterprise at present in existence. There is every probability for the supposition that the Phœnician,† 3000 years ago, traded to the Cornish shores for tin, and written records show that the metal was largely exported thence during the time of the Roman supremacy. It has even been surmised that tin was obtained from the west of Britain in the pre-historic age of bronze, and possibly in an epoch of the earth's history still more remote and contemporaneous with the existence of the mammoth in that period when the general level of Cornwall and Devonshire was at least 30 ft. higher than it now is, and when the primeval forest, whose remains submerged by the sea are still discoverable, flourished around the present coast line of the two counties.

Yet whilst the West of England can claim such antiquity as a tin-yielding district, there is no literary or archaeological record hitherto discovered to justify the conclusion that copper was raised there prior to the fifteenth century. It might of course be argued that as tin was taken from Cornwall at such an early period, copper, found in later times in such enormous quantities, is likely to have been known and raised there in an age quite as distant. The copper of the ancient bronze implements found in the West of England, and the presence there of a small bronze bull's of Phœnician workmanship, might appear to form grounds for such a supposition. But there is no positive proof that those articles were made in the West of England, and it might be contended on the other hand that the abundance of copper in the eastern countries of the Mediterranean in those early times would preclude the necessity for foreigners trading for copper to the remote Cassiterides, and the ancient Britons would hardly trouble themselves to search for copper when tin was the only metal exported. Such reasoning, however, is merely one of possibilities, but the idea that copper was not raised in Britain at any very early period is supported by the fact that whilst several of the Greek and Roman writers mention tin as being raised in Britain, not one of them records copper being found there. Cæsar, indeed, distinctly states|| that the Britons imported copper to their country from Gaul. Geological research, too, shows it to be highly improbable that any large quantities of copper have ever existed *in natura* near the surface of the land in the West of England, and one eminent authority on matters connected with Cornish mining notices the absence of ancient tools in the old copper workings of Cornwall as indicating that those workings are not of a very great antiquity.**

Of mining transactions in Cornwall and Devonshire during the Saxon period of our history no record has yet been traced, and from the Norman and middle ages only very scanty information has come down to us. In an important charter granted by King John†† in 1201 to the tinnors (as the miners of Cornwall and Devonshire were commonly called until within about the last 50 years), no mention is made of copper in Cornwall, neither is that metal spoken of in a great charter issued to the tinnors by Edward I. in 1305, nor in a few other minor charters of an earlier date by other kings. Copper also is not named in a letter from Henry IV.‡‡ giving a free passport to Venetian galleys (the principal traders to England in the 15th century) for fetching "wool, cloth, or tin" from this country. The earliest direct mention of copper in Cornwall is in a document of Henry VI., dated 1453§§, by which one John Botright was appointed governor of all the mines in Cornwall and Devonshire, and the king claimed tithes of all copper, lead, or tin from which gold or silver should happen to come. In 1456 a document||| was issued at Venice regulating the trade of copper, &c., from London, and in 1485|| the Doge Mocenigo granted to one Bartolomeo Minio an appointment as captain of a galley to bring tin or copper from London. But it is exceedingly probable that much of the copper then exported was raised in other parts of England than Cornwall and Devonshire***, although the document of Henry VI. just mentioned certainly proves that copper was known and raised in the West of England in the 15th century. But although numerous State papers of the time of Henry VII. speak of tin raised in the West of England, we can trace none in his reign referring to copper.††† A warrant of Henry VIII.‡‡‡, however, mentions copper being found in Cornwall, and several State papers of the time of Edward VI. and Elizabeth refer to copper in Cornwall and other parts of England.††††

The able writer§§§ on Cornish mining already referred to expresses

* Westward of our supposed line the surface presents one almost uninterrupted series of hill and vale, of barren upland and extremely fertile glen. Geologically considered the district beneath the surface earth consists chiefly of transition or intermediate groups of clay slate rock of the Devonian System, the variety found in the greatest abundance being locally known as "killas." Interspersing the clay slate are enormous masses of a greyish-white granite, which on the surface often rise into the most fantastic shapes. At the sea coast, formed either by granite or clay slate, are awe-inspiring cliffs. Surrounding the granitic masses is a changed condition of the granite, locally termed "killas," and running through the granite, grown, and clay-slate chiefly in an E.N.E. and W.N.W. direction, is a rock known as elvan, and it is a remarkable fact that most of the ores of tin and copper have been found in the elvan courses. Lead, iron, manganese, zinc, and chalcocite are also now mined in large quantities. The highest hills in the district are Brown Valley, four miles south-east of Camelford 1570 feet, Carraton Down 1208 feet, and Hensbarrow. It may be mentioned that Dartmoor, the only considerable table-land in the district, once formed part of the county of Cornwall, and is still included in the Duchy. For a detailed geological account of Cornwall and Devonshire see Sir H. De la Beche's exhaustive Report of the Geological Survey of Cornwall, Devonshire, and West Somerset (London, Longmans and Co., 1859); also an Account of the Metalliferous Deposits of Cornwall and Devon, by W. J. Henwood, F.R.S., &c., &c., in Transactions Geological Society of Cornwall, vol. v., pp. 1-366. See also the valuable "Mineral Statistics," compiled annually by Mr. Robert Hunt, F.R.S., of the Mining Record Office. Very little "native" tin has been found in the West of England, most of it being found as an oxide. For an account of two of the largest pieces obtained see extracts from two letters from Dr. Wm. Borlase to the Librarian of the Royal Society, Philosophical Transactions, vol. x., p. 35.

† An excellent summary of the arguments in favour of the Phœnician and other ancient intercourse with Britain for tin is given in a little pamphlet, or "Historical Sketch of the Tin Trade in Cornwall," by Wm. Copeland Borlase, Esq., M.A., F.R.S.A. (Plymouth, 1874. See also the "Cassiterides," by Ges. Smith, LL.D., &c., &c., of Cambror, London (Longmans, 1858).

†† On this point see an able and interesting paper on the Dextral Tin Ore of Cornwall, by W. J. Henwood, F.R.S., in Journal Royal Institution, Cornwall, vol. iv. A paper on the Antiquity of Mining in the West of England, by R. N. Worth, F.G.S., may also be consulted.

‡‡ An account of this bull is given in the already quoted work by W. Borlase Esq., M.A.

‡‡‡ Commentarii, lib. V., c. 13. Cæsar's statement is also noticed by Joseph Carne, F.R.S., &c., in an able paper on Cornish Copper, published in Trans. Roy. Geological Soc. of Cornwall, vol. III., p. 35, dated 1824.

§§ See Carne—op. cit.

|| No mention whatever is made of Cornish mining in Domesday Book. The charter by John and that by Edward I. are given in De la Beche's report already quoted. See appendix A.

||| See works published by Public Record Commissioners—Calendar of State papers relating to English affairs existing in the archives and collections of Venice, by Rawdon Brown. London: Longmans (see vol. I. p. 40).

§§ Given in De la Beche's report—Appendix, p. 847.

||| See Calendar of State papers of Venice—op. cit., vol. I., p. 85. Ibid, p. 148.

††† On this point see Carne in the paper already quoted.

†††† See publications of Rev. Commrs.—work on reign of Henry VII., edited by Rev. W. Campbell, M.A.

‡‡‡ See Carne, op. cit.—also Record Commissioners—papers of Henry VIII. We have not thought proper to trace State papers on copper later than the reign of Elizabeth, as so far back as that date we have reliable information from other sources.

§§§ Again see Carne, op. cit.

In opinion that prior to the year 1700 copper in Cornwall was principally, if not wholly, taken from the tin mines.* Such a statement, however, should be received with some qualification, for from a small volume compiled a few years since on the copper smelting works at Swansea it appears that a mine solely for copper, and which yielded over 100 tons of the metal annually, was worked at Perin (Perran) Sands, Cornwall, so early as 1584, and that a person was in the same year sent from London to undertake its management. The volume also mentions a copper lode as being discovered in that year at St. Ann's, Logan, from which was taken so much as 10 tons of the metal in one week. John Norden, who in 1584 wrote an account of Cornwall, refers to copper as "a commodious metal, wherof much is founde in this countrie (Cornwall).§" and notices copper mines as existing in Penwith Hundred, at Morvah, Zennan, and Lelant; but from the general tenor of his statements and those of other writers on the same subject it seems that the great value and extent of the metal in Cornwall was at that time known to but few persons besides those concerned with its raising or preparation. In an address to King James I. on copper in Cornwall Norden speaks of copper works there as having been "formerly extenuated by pryvate pryres into the secrete, and covertly followed for their own gaine," and strongly sets forth to His Majesty the probable abundance of the metal, and the greater gain that would be derived by the Crown by its working or levying dues upon the copper mines rather than those of tin.

We think it may be safely assumed that about the year 1584 the copper trade in the West of England had begun to assume an important aspect, though only very scanty information can now be gleaned as to the state of the trade during the following century. Carew in the year 1602 in his Survey of Cornwall, whilst devoting several pages to a description of tin raising, merely remarks** with reference to copper that "it is founde in sundrie places," but with what gain to the searchers he could not discover. He also found that the ore was sent to be refined in Wales, "either to save cost in fuel or to conceal the profits." Tonkin, who in 1739 wrote the notes† to Carew's Survey, says—"Within these last 60 years copper has been turned to very great account in this county, and there have been great discoveries made therein," and then proceeds to a description of the various kinds of ore found. From such statements it should appear that copper raising in Cornwall in the seventeenth century was in its infancy. It, too, would seem that after starting into vigour near the close of the sixteenth century the trade languished for some time, or, as is suggested by most writers on the subject, it might have been carried on clandestinely, in order to avoid the payment, as in the case of tin, of fees to the lords of the soil, or the levying of heavy dues by the Duchy. Probably this latter idea is correct, and the copper raising enterprise was trammelled for many years owing to the miners' unwillingness to work openly, lest they should lose, by way of fines or otherwise, any of their enormous profits. But in the beginning of the eighteenth century the copper trade appears to have entered upon a period of continued prosperity and progress. In the "Natural History of Cornwall," by Dr. Borlase, it is stated that about 50 years before that work was written, or about the year 1708, "some gentlemen of Bristol|| bought copper ore (in Cornwall) at a low rate, and engaged as adventurers in some old mines." They subsequently were greatly aided by a Mr. John Costar, who "by means of a water-engine drained the old mines." In Borlase's day much of the copper was shipped to be refined in Wales and Bristol. In his time tin was almost invariably rejected for copper, and the average annual value of copper produced during a period of 14 years was 160,000l. The enormous quantities of copper raised in the West of England in Borlase's time may, perhaps, be accounted for by the geological fact that the tin and copper of the district are found to lie in huge irregular layers or beds, members from which run out in the usual zig-zag manner of lodes into the superincumbent or subjacent layer, and sometimes permeate completely through it. Extending from the surface for dozens of fathoms there appears to have been a massive bed of tin, which afforded metal for many ages. In the sixteenth and seventeenth centuries the copper miners had probably been working upon the leaders or straggling veins of the copper, and in the eighteenth century the workers came upon the main body.

Dr. Borlase also says|| copper has never turned out any considerable profits to the owners of the land till within these last sixty years, and the richness of our copper works is not a late discovery, but the application of the Cornish to work them effectually is not so old as the present generation.|| We think, however, that what has just been stated of the copper trade in 1584 must somewhat modify this last remark. The conclusion to be drawn from these quotations, and the others above given is, doubtless that but little record was kept, and as well as now, but little known in the last century of the early history of Cornish copper mining. And we may here glance at a statement in Lord Macaulay's "History of England," which, it appears to us, conveys a slightly misleading notion of the state of the copper trade in the West of England in the seventeenth century. He says*** "But the veins of copper which lie in the same region (Cornwall and Devonshire) were in the time of Charles II. altogether neglected, nor did any landowner take them into account in estimating the value of his property." The improbability of the first part of this statement will be obvious, whilst if the latter portion were correct it were not so because the presence of the metal was unknown or not raised in important quantities, but owing to the miners, whose greed of gain though poor ground, exclusiveness were become proverbial, keeping the knowledge of the enormous quantities of copper in their district a secret among themselves. Macaulay quotes as his authorities the works here mentioned of Carew and Borlase, but in neither of these books can any statement be found to justify the idea he has taken. From the foregoing remarks we think it will be seen that although copper mining in the West of England cannot boast of such a remote commencement as its kindred industry of tin, it still was in existence at a much earlier period than has hitherto generally been believed.

Leadenhall-street, London.

JAMES QUICK.

Died.—On Feb. 27, at Minera, near Wrexham, deservedly respected, aged 71, Mr. WILLIAM MICHELL, who for nearly 40 years was agent at the Lisburn and Cwmystwith Mines, Cardiganshire.

EPPE'S COCOA.—GRATEFUL AND COMFORTING.—"By a thorough knowledge of the natural laws which govern the operations of digestion and nutrition, and by a careful application of the fine properties of well-selected cocoa, Mr. Eppe has provided our breakfast tables with a delicately flavoured beverage which may save us many heavy doctors' bills. It is by the judicious use of such articles of diet that a constitution may be gradually built up until strong enough to resist every tendency to disease. Hundreds of subtle maladies are floating around us ready to attack wherever there is a weak point. We may escape many a fatal shaft by keeping ourselves well fortified with pure blood and a properly nourished frame."—*Cham. Service Gazette.* Sold only in packets labelled—"JAMES EPPE and Co., Homoeopathic Chemists, London."

* The above given papers down to the time of Henry VIII. are the only few traceable. Only a few similar scanty notices on the subject occur in later years. † "The Smelting of Copper in the Swansea District" from the time of Elizabeth to the present day. By Major Grant Francis, F.S.A., &c., Swansea, 1867. For private circulation. Fifty copies only printed. The book contains extracts from the "Cambrian" newspaper, and copies of old correspondence on copper smelting, &c., among other letters there being several between different persons and one Ulrik Fross—the person mentioned above as having been sent from London to conduct the Cornish copper mining. It appears from this little work that copper was at first smelted at St. Ives, Cornwall, and afterwards shipped to Neath to be refined.

§ See his "Speculi Britannici Pars," London. Republished by Christopher Bateman, 1728. From the last paragraph of the prefixed "Account of the Author," it appears that Norden wrote the book in 1584.

|| Ibid, p. 17. § Ibid, p. 34. || Ibid, p. 40.

§ See Lyson's Magna Britannia, part 3, p. cxxvii.

|| Survey of Cornwall, p. 22.

†† These were published in Lord de Dunstanville's edition, which see p. 22.

|| See "Natural History of Cornwall," by Rev. Dr. Borlase, F.R.S., &c. Oxford: 1755. Pp. 265, &c.

§§ To give further particulars about the copper trade of the eighteenth century—the golden century of copper mining—would be superfluous, so much has been already written on the subject. For statistics of copper mining in the West of England see Journal of Statistical Society, paper by Sir C. Lemon; also De la Beeche's report; and for later years Prof. Hunt's Annual Mineral Statistics. It may be mentioned that of early copper mining in Devonshire alone simply nothing can be traced. De la Beeche says (Report, page 608)—"though it would appear that copper was raised in Devon early in the last century, it was not until the commencement of the present that the mines became important."

|| In Natural History, p. 198. || Ibid, p. 205.

†† In "History of England," Vol. I., p. 184.

Meetings of Public Companies.

MALPASO GOLD WASHING COMPANY.

An extraordinary general meeting of shareholders was held at the company's offices, Winchester House, Old Broad-street, on Tuesday, Mr. J. T. P. PRECHY in the chair.

The CHAIRMAN said that before calling on the secretary to read the notice convening the meeting he must express his regret that Mr. Rogers was unable to attend the meeting through severe illness. Mr. Rogers had asked him to convey his regret to the shareholders, and he could assure them that even that morning he had the intention of making an effort to come to town, but his medical adviser strictly forbade him doing so.

Mr. SYDNEY A. COBBETT (the secretary) read the notice convening the meeting, which stated that it was an extraordinary general meeting "for the purpose of considering, and if thought fit of passing, the following special resolutions or such modifications of the same as the meeting shall approve:—1. That the Malpas Gold Washing Company (Limited) be wound-up voluntarily.—2. That Sydney Alfred Cobbett, of No. 1, Winchester House, Old Broad-street, in the City of London, be appointed liquidator of the same.—3. That the liquidator shall sell and dispose of the entire property of the company (retaining only so much as may be required for satisfying the claims of dissentient members, under section 161 of the Companies Act, 1862) to a new company formed, or about to be formed, by the name of the Colombian Hydraulic Mining Company (Limited), with the objects and for the purposes expressed in the annexed scheme, in consideration of the said Colombian Hydraulic Mining Company (Limited) (undertaking to pay all the liabilities of the said Malpas Gold Washing Company (Limited), including the dividend set apart for, but not yet paid to the preference shareholders, and handing over to the liquidator of the said Malpas Gold Washing Company (Limited) for distribution among the shareholders 29,920 fully paid-up shares of 1l. each, in the said new company.)"

The CHAIRMAN said this was an extraordinary general meeting of the shareholders, convened for the purpose of considering and, if thought fit, of passing the resolutions which had just been read by the secretary. He thought, however, that before going into the details of the plan of amalgamation of this company with the Rica and Malabar Companies which had been submitted to the shareholders, it was only just to the proprietors, as well as his co-directors and himself, that he should say a few words with reference to the petitions for a final winding-up of these companies which had been presented in October last, and which, as the shareholders were aware, had lately been dismissed by the Court of Appeal. After remarking that the directors considered when these petitions were presented that there existed no reason whatever why the companies should be wound-up finally, in which view they were supported by a large majority of the shareholders, he (the Chairman) proceeded to say that he and his colleague, Mr. Cobbett, together with Mr. Rogers, had been subjected to a severe cross-examination on the affidavits they had put in denying the allegations set forth in the petitions. As to these allegations, he might quote the words of the Master of the Rolls, who gave the decision in the Court of Appeal, that "when we come to deal with vague allegations of this kind I think no criticism is too severe. People are not to be brought into Court on a charge of fraud of this kind, and accused of fraud." The result of this cross-examination was stated to have been placed before the shareholders in the circular issued by the petitioner on Jan. 9, to which the company's counsel would have replied fully had he been called upon to speak. After commenting in severe terms on the puerile character of this circular, all the statements in which, with two or three exceptions, were well-known to any shareholder who took the trouble to read the prospectus and the subsequent annual reports, the Chairman proceeded to say that it was perfectly true that he and his colleague, Mr. Cobbett, who had both taken and paid upon their qualification shares the same as any other shareholder, and had purchased large numbers of shares as well as at a high premium, had, long subsequently to the formation of the company, accepted a present from the vendors of some fully paid-up shares. For his own part, on receiving them he congratulated himself that he was likely to get some return for the hardships he had experienced during two years gold mining in California, by which he had acquired a knowledge of the hydraulic process. However, as there had been some discussion on the matter, both Mr. Cobbett and himself had formally handed the said shares to the secretary, to be held for the benefit of the company. It would, perhaps, be interesting to the shareholders to know that the petitioner himself accepted a "present" of fully paid-up shares in the Malabar Company. With reference to the statement that "on Dec. 18, 1878, the minute-book shows that cheques were drawn in favour of each of the directors, the cheques in question practically exhausted the small balance then remaining to the credit of the company at its bankers," he put it to the proprietors as men of business and men of common sense whether the impression this conveyed was not that the directors had, if not unlawfully, at all events improperly, appropriated amongst themselves the remaining funds of the company. In this sense the statement was utterly and entirely false, and he could not bring himself to believe that anyone holding the position of the petitioner could put his name to such a statement had he known the explanation which had been given that the said cheques were simply the repayment of an advance made by the directors to meet a draft falling due at the end of November, an explanation which was given in cross-examination. It was no wonder that on statements like these the petitioner received the support of some 60 shareholders, holding, as he (the Chairman) understood, about 3000 shares in this company. Nor was it to be wondered that when a brief explanation of some of these statements had been placed before the shareholders from an independent source, those 60 shareholders dwindled down to eight, supporting the petition in the Court of Appeal. He could well imagine the disgust which some shareholders must feel on finding the way in which they had been led to give their support to the petitioner, and the estimate formed of the matter by the general body of shareholders was shown by the enormous support he (the Chairman) had received to his plan of amalgamation. Proceeding to discuss the plan of amalgamation in all its details, he stated he believed it was as fair a scheme to the shareholders of the three companies as it was possible to obtain. The directors were prepared to subscribe at least 1500l. of the debentures proposed to be issued, and he believed they would be readily taken up when it was considered that they constituted a first charge on the whole of the properties now owned by the three companies, and that the Malpas Mine at the present level had realised in the past three years a profit of 2000l. The works now about to be completed would, it was believed, result in large profits within a short period. The debentures would be issued in sums of 100l., 50l., and 10l. each, so as to give every shareholder an opportunity of subscribing. The present directors of the three companies would act as directors of the new company until the first statutory meeting, to be held within four months of the incorporation of the company. At that meeting they would all retire, and leave their re-election, or the appointment of their successors, in the hands of the shareholders. It only remained for him to say that the directors had at their own risk fought and won this battle for the shareholders, and he hoped that having conquered it would now be forgotten that they had ever fought, and that as men of business, wishing to retrieve if possible the mistakes of the past, they would all for the future pull together, and endeavour to make the new company, if they should decide upon forming it, a great success. He concluded by moving the first resolution.

Mr. HOPKINSON, in seconding the resolution, said that he was not an original director, and was not responsible for anything that occurred until he joined the board two and a half years ago. He now, however, held a large stake, and he might say that before he took his seat at the board he satisfied himself that no company had ever been more fairly formed in the City of London. Had he not ascertained this he would never have joined himself, nor sent a relative as he had done to the mines. He never knew a more attentive board of directors (he did not include himself), and he was sure that they had spared no pains to make the concern a success. He thought a more unjustifiable and unfair attack than that they had been subjected to had never been made, but it was not altogether without advantage, as it had afforded them the opportunity of offering explanations. He regretted the position in which they were as much as anyone, but felt convinced that unless they were all prepared to make some sacrifice everything would be lost. Mr. JONES said he was a large shareholder, holding over 1000 shares in the three companies, and protested against the whole of the proceedings. He objected to a winding-up, and thought they should thoroughly examine all books and documents belonging to the company before deciding upon anything.

A SHAREHOLDER thought they had all made up their minds as to the course to be adopted. They could not avoid loss, but the question was to make that loss as light as possible. This was secured by the scheme at present before them. The resolutions were then put and carried, Mr. Jones voting against the first and second, and then leaving the room, after which the voting was unanimous, the proceedings terminating with the usual vote of thanks.

RICHA GOLD WASHING COMPANY.—At the meeting on Tuesday the proceedings were identical with those of the Malpas Company. In the first resolution the name "Rica" was substituted for "Malpas," and the bracketed portion of the third resolution read (undertaking to pay all the liabilities of the said Rica Gold Washing Company (Limited), and handing over to the liquidator of the said Rica Gold Washing Company (Limited) for distribution among the shareholders 16,000 fully-paid-up shares of 1l. each in the said new company). All the resolutions were carried unanimously.

MALABAR GOLD WASHING COMPANY.—At the meeting, on Tuesday, the proceedings were nearly identical with those in the Malpas and Rica Companies. In the first resolution the name "Malabar" was substituted for "Malpas," and the bracketed portion of the third resolution read (undertaking to pay all the liabilities of the said Malabar Gold Washing Company (Limited), and handing over to the liquidator of the said Malabar Gold Washing Company (Limited) for distribution among the shareholders 29,736 fully-paid-up shares of 1l. in the said new company). The Chairman stated the objects for which the meeting was called, and explained the details of the plan of amalgamation with the Rica and Malpas Companies, which he considered would meet the interests of all concerned.—The Rev. Mr. Peterson opposed the amalgamation of the company, believing that greater benefit would result to the shareholders if they followed the plan which he had proposed to adopt.—Mr. Gray, in a lengthy speech, thought that the Malabar shareholders should receive a larger interest in the new company.—Mr. Beaton and other shareholders supported the scheme of the directors, and the Chairman having replied, the resolutions were put to the meeting and carried.

MARELLA IRON ORE COMPANY.

The annual general meeting of shareholders was held at the offices, Crown Buildings, Queen Victoria-street, on Tuesday, Mr. WILLIAM SMITH, of Glasgow, in the chair. The report, which was taken as read, showed that the output of ore had been 11,848 tons, and the estimated quantity of deads removed 41,300 tons. In consequence of this small production the cost per ton had been heavier than usual. The shipments have been 21,900 tons. Under the new arrangement much more satisfactory results might be expected. The pier, railway, rolling stock, and other plant had been maintained in good order.

The CHAIRMAN stated that the company had passed through an unfortunate year. The most vexatious point was with regard to the ore, the heaps of which had been accumulating for many years, but it had been found on shipping the same that they were minus a considerable quantity to what they expected. Then they had had to contend with low prices and a depressed state of trade. It was thought that a good deal of ore had been lost in connection with the conveyance of it by donkey loads, but arrangements had been made which would, it was hoped, prevent it occurring again. Having touched upon other matters, he moved the adoption of the report.

Mr. P. W. SPENCE seconded the motion, which was unanimously adopted.

Mr. W. Smith, one of the retiring directors, was re-elected. Mr. James Downie did not offer himself for re-election. The retiring auditors, Messrs. Turquand, Young, and Co., were re-elected.

A vote of thanks to the Chairman and directors closed the proceedings.

LAST CHANCE SILVER MINING COMPANY.

At the meeting of shareholders held last Friday the CHAIRMAN read a carefully prepared statement in the form of a speech, from which it appeared that on April 17, 1878, he arrived at the mines in Utah. All the machinery (including pumps, boiler, hoisting-engine, &c.) was on its way to the mine. But just before his arrival at Salt Lake City an avalanche had swept away all the company's buildings at the mine. A neighbouring building was rented at 2l. per month from May 1, but the title was in dispute, and the occupants refused to give it up. They, therefore, re-erected their own buildings on the spur of a mountain for future safety, and completed them in June. Soon after they were without funds, and the materials were stopped at the railway stations through non-payment of freight. They made a start in August, but were soon again brought to a deadlock for want of funds. They were again ready for another start at the end of September, bought some little fuel, and commenced pumping, but were again brought to a standstill for want of funds, and remittances from England being hopeless, they had no alternative but to shut up. He considered that the company had had the full value for the money expended, and explained that the business before the meeting was to consider the best means of raising the funds required, to fill up the vacancies at the board, and then, having made the meeting extraordinary, to pass such resolutions as might be deemed expedient for the future working of the company.

The CHAIRMAN, in reply to questions from shareholders, stated that their title was not sold, and that they had important tunnel rights. They are entitled to drive their tunnel 3000 ft., and are entitled to all veins not previously known, which they may cut. They have 1200 ft. more to drive much of which is in virgin ground. If he had had 500l. when he was over there he could have pulled everything through, but now they required 2000l. Their liabilities are 800l., or 1000l., and there is about 100l. for arrears of wages. He thought they would be able to pull through with 3000l. There are 400 shareholders, but 10,000 out of the 20,000 shares are held on the Stock Exchange, and they could expect no assistance from that quarter. At the extraordinary meeting it was resolved to issue 5000l. worth of 20 per cent. preference shares, the dividends to be cumulative, and the amount of such shares and arrears of dividends thereon to be a first charge, as between the ordinary and preference shareholders, if the company be wound up.

CARN BREA MINING COMPANY.

A meeting of adventurers was held at the mine on Monday.—Capt. Wm. TRAGUE presiding. The accounts showed that the balance against the adventurers amounted to 22,196l., as against 26,012l. at the last meeting. The agents' report showed that there had been no falling off in the production, but several things had been altered.

Mr. HEARD wanted to know why so large an amount as 75 tons of tin had been credited?—The CHAIRMAN explained that it was all ready for sale, but it had been kept on hand owing to the recent rise in the price of tin, and could be sold whenever necessary.

Mr. HEARD thought most mine adventurers had come to the decision that tin was not sold should not be credited. The CHAIRMAN did not altogether agree with the system, but thought that in the present condition of the market they were justified in so doing. The average price at their last meeting was 33l. per ton, whereas now it was worth over 36l. a ton; but he did not think it would be wise to throw a large quantity of tin on the market all at once. It would not only fetch a less price, but have a tendency to damp the market. The tin would not be kept for any length of time. He did not hold with keeping tin on hand, only under exceptional circumstances.

On the motion of Mr. HINGSTON the agents' report, which was considered satisfactory, was adopted.—The CHAIRMAN moved the adoption of the accounts, which was seconded by Mr. HEARD, and carried unanimously.

The CHAIRMAN recommended that in future the accounts be held every 16 weeks, which would enable them to do away with the thirteenth month system. He thought it would simplify matters and give satisfaction to all present.—Mr. HINGSTON accordingly moved a resolution to that effect, which was seconded by Capt. OLEMES, and carried unanimously.

The CHAIRMAN observed that it was true they had had bad times, but when things improved they would not be worse off, but they would have benefited from the economy that had been forced upon them in the working of the mine—not in any one particular, but generally. Formerly they considered that if they could return their tin for 50l. they were doing well; and then if tin were 60l. a ton they would have 30l. per ton profit. At present they were returning their tin at 35l. a ton which he considered satisfactory, for it showed them that tin at 60l. or 65l. a ton would give them as good a profit as 75l. or 80l. would formerly. He did not mean that they could do better than their neighbours, but it showed them that oftentimes good came out of evil. (Hear, hear.)

TINCROFT MINING COMPANY.

A meeting of shareholders was held at the mine on Monday.—Capt. WILLIAM TRAGUE in the chair. The accounts showed a profit on the three months' working of 1758l. 9s. 10d. The total amount against the mine was 11,285l. 17s. 11d. The calls had been paid up very well indeed.

Mr. HINGSTON asked the cost of raising tin in Tincroft, and the CHAIRMAN said they were doing better there than at Carn Brea—they raised it for 27l. If the depression would pass over, and things began to improve, he did not think they would be any worse off for the difficulties with which they had had to contend, because they had certainly learned a lesson, and they were better able to return tin at the present price than they were formerly with tin at 70l. a ton. There was no question about it in his mind.

The accounts and agents' report were adopted, after which, on the motion of the CHAIRMAN, seconded by Capt. OLEMES, it was resolved that the sixteen weeks system of holding their meetings be adopted.

Mr. HINGSTON thought it was a tolerably well ascertained fact that the Australian supplies of tin were really falling off, and although he supposed those present

did not wish them any harm, he did not suppose they wished them to return exactly the same quantities of tin as in the past. As regards the mines in which they were interested, he thought they should be thankful to know that they were able to return such large quantities, and he also thought there was every prospect of their continuing as good in the future. It had been said that poverty made them acquainted with strange bedfellows, but it had made them acquainted with a very welcome friend in the shape of economy, and by dint of economy in every department they had been able to raise tin at 34. a ton at Carn Brea, and at Tincroft at 27. a ton. He proposed a vote of thanks and continued confidence in Capt. Teague and the agents.—Capt. CLEMMES seconded.

Capt. TEAGUE, in reply, said it afforded him pleasure to meet them there that day, especially under such favourable circumstances. Nothing had been done unduly to bring about that result, everything had been going on fairly, and they were in as good a position in every respect as they were three months ago. He had every reason to believe that a similar result would be shown at their next meeting. If they got an increased price certainly it would be so much more in their favour. It was his opinion that if only 2. a ton more were put on the price of tin they would be in as good a position as when tin was 70. per ton, because they would then have to pay more money to their labourers. The machinery was in such a condition, and the outlay was already made for further improvements, so that there were no heavy costs to be expected, to enable them to work on at that rate. The miners, he knew, were only getting on an average about 50s. a month, but when the time came he would gladly pay them more. (Hear, hear.) He could bear testimony to the patient endurance of the miners, and the way in which they had received the reduced amount of wages. They had borne it patiently, and it could not be spoken too highly of. (Applause.) It was true wages were low, but they were not lower than they were 25 years ago. Thirty years ago the miners of Tincroft and Carn Brea were paid less wages than now. He would like to pay the men more, but it was the force of circumstances that compelled them to fall back upon the reduction of labour costs, in order to tide over the difficulty. He wished the Australians no harm, but wished they could do a great deal better, and if his voice could reach them he would recommend them to give up tin mining and go in search of gold. (Laughter.) It was amazing to know how the consumption of tin had gone on increasing, while anything else it was difficult to sell. They could sell any amount of tin at the present price; that commodity did not lie on the market. He had been offered an increased price for the present for all the tin he had got to sell during the next five years, but he had not accepted it. (Laughter.) He believed they had every reason to hope that better times were looming in the distance, and he hoped they would shortly be able to participate in a further increase in the tin standards. (Applause.)

Capt. TEAGUE, jun., in speaking for the agents, said he thought the adventurers must give them credit for using efficiency and economy. He mentioned with satisfaction that in Tincroft and Carn Brea they had had no difficulties to encounter in keeping the mines dry, and not a single man had been hindered for a single day throughout the winter. Their drawing machinery was in very good condition, and if they could only have a little better price—which he believed, with his father, was looming in the distance—they would be in a highly satisfactory position. The consumption of tin was very great and increasing, and as trade revived he did not doubt that the price of tin would increase. (Applause.)

—Western Daily Mercury.

[For remainder of Meetings see to-day's Journal.]

THE SCOTCH MINING SHARE MARKET—WEEKLY REPORT AND LIST OF PRICES.

During the past week there has been a little more business doing, and as prices are generally very low it is probable this inducement to investors will encourage some improvement. The appearance of politics continues favourable, and in some departments of trade, especially the iron market, slight improvements are noted, though, as a rule, the position is unaltered. Money remains cheap, and is cheapening.

In shares of coal and iron companies, Arncliffe has advanced 1. per share on the week, but Bolekow, Vaughan (A) have fallen 10s. and Cairn table 5s. Benhar is unaltered and nominal at 13s. 6d. to 15s. Bolekow, Vaughan, and Company have recommended a dividend of 5 per cent. Two events of importance to iron trade have occurred this week, the effect of which will be that the action against these directors and others for reduction, and damages will be prosecuted. The coupons due June 15 and Dec. 15 next on Pannicello debentures are now being cashed under discount at the Bank minimum rate. Tharsis have fluctuated only from 21½ to 21¾ all the week. Hultafall are at 20s. to 25s. Rio Tinto 5 percent., 40. Yorke Peninsula (ordinary), 2s. 6d. to 3s. 9d. In share of home mines there is little doing, but the tendency is upwards. Gunnislake (Clitters) shares seem low, as they have a good balance in hand to make a dividend. The report of the Mining Company of Ireland is again a disappointing one, but the directors hope some improvement may soon appear, at the Knockmore property operations may now be considered as closed. Great Laxey, 15 to 16. Gunnislake (Clitters), 7s. 6d. to 12s. 6d. North Hendre, 5 to 6. Wheel Crebor, 5s. 6d. Wheel Kitty (St. Agnes), 1s. 6d.

In shares of gold and silver mines Richmonds are 15s. lower; this week's run is £50,000. The produce of St. John Del Rey for second division of February has been 10,500 ozs., and the yield 6.3. Almada and Tinto are at 5s.; Chicago Silver, 19s. to 17s. 6d.; Chontales, 12s. 6d.; Colorado United, 30s. to 35s.; Don Pedro, 17s. 6d.; Eberhardt, 67s. 6d.; Emma, 2s. 6d.; Eschequer, 3s. 9d.; Flagstaff, 5s. to 7s. 6d.; Rosca Grande, 2s. South Aurora, 2s. 6d. to 5s. In shares of oil companies Uphall are 7s. 6d. and Oakbank 1s.—both higher. Young's Paraffin have been steady, at 14½ to 14¾. Runcoorn Soap and Alkali, 8½ ds.

In shares of miscellaneous companies the dealings are very limited. Avonside are 7½ ds.; Earle's Shipbuilding, 23½ ds. In wagon companies shares, Scottish (new issue) are offered 5s. cheaper, at 60s. per share. The Lincoln Wagon and Engine Company recommend a dividend of 8 per cent. for past half-year, carrying forward 1700. Prices of shares are—Birmingham, 13½; Bristol and South Wales, 6½; Bristol, 2½ ds.; Gloucester, 6½; Lancaster, 4; Metropolitan, 2½; Midland, 6½; Railway Carriage, 4; Starbuck, 12; Swansea, 1½; Wakefield 1½; Western, 3½; and Yorkshire, 14. Chemical companies shares are neglected, prices being—Langdale's, 4½ to 4¾; Lawes' 8½ to 8¾; and Newcastle, ¾ to 1.

NEW LEAD MINING COMPANY.—A property in Wales, parallel with the Nant, which gave a profit of 1,000,000. to the Westminster family, and west of an extensive range of mines that yielded the same family 1,000,000. in royalties, is about to be formed into a public company. The leases are five in number, and a lode of exceptional wealth has been discovered in the very centre of the group. The discoveries made are valued at 100,000., which a very small capital will render productive. Further particulars of this adventure will be ready soon.

The following calculations show the yield per cent. on money invested at present prices in the shares named, based upon the last average yearly dividends being maintained:—In coal and iron companies Arncliffe would yield 11½; Bolekow, Vaughan, A, 6½; Cairn table, 18; and Muntz's Metal, 7½. In oil companies Dalmeny would yield 5½; Oakbank, 8; ditto (new), 7½; Prices' Patent Candle, 8½; Uphall, 3½; and Young's Paraffin, 10½. Great Laxey Mine would yield 6½; Tharsis Sulphur and Copper, 8; and ditto (new), 8½. Among miscellaneous investments Liverpool Rubber may be mentioned to yield 7½; Milner's Safe, 7½; Phospho-Guano, 8½; Scottish Wagon, 6; ditto (new), 6½; and Starbuck Wagon, 8½.

Capital. Dividends. Rate per cent. Description of shares. Last price.

Per share.	Paid up.	Previous.	Last.	Description of shares.	Last price.
10	48	48	48	COAL, IRON, STEEL.	
10	10	4	4	Arncliffe Coal (Limited)	14s. 6d.
100	55	35s. 6d.	35s. 6d.	Benhar Coal (Limited)	54
10	10	10	10	Bolckow, Vaughan, and Co. (Lim.)	54
10	10	10	10	Cairn table Gas Coal (Limited)	42s. 6d.
10	10	10	10	Chillington Iron (Limited)	42s. 6d.
23	20	10s. 10d.	10s. 10d.	Clyde Coal (Limited)	70s.
10	7	nil	nil	Ebbw Vale Steel, Iron, and Coal (Lim.)	70s.
10	10	nil	nil	Fife Coal (Limited)	75s.
10	10	nil	nil	Glasgow Fort Washington Iron & Coal (L)	42s. 6d.
10	10	nil	nil	Ditto Prepaid	35s.
10	10	nil	nil	Lochore and Caplethrae (Limited)	40s.
10	10	nil	nil	Marbella Iron Ore (Limited)	25s.
10	10	nil	nil	Monkland Iron and Coal (Limited)	16s.
10	10	5	4	Ditto Guaranteed Preference	40s.
100	100	nil	nil	Nant-y-Glo & Blaenau Ironworks pref. (L)	10
6	6	nil	nil	Omoa & Cleland Iron & Coal (L. & Red.)	7s. 6d.
1	1	15	15	Scottish Australian Mining (Lim.)	35s.
1	10s.	15	15	Ditto New	16s. 3d.
Stock	100	nil	nil	Shotts Iron	60
				COPPER, SULPHUR, TIN.	
4	4	—	—	Canadian Copper and Sulphur (Lim.)	5s.
10	7	7s. 6d.	35s. 6d.	Cape Copper (Limited)	27
1	1	7½	2½	Glasgow Carado Copper Mining (Lim.)	10s.
1	15s.	7½	2½	Ditto New	13s. 6d.
10	9½	nil	nil	Huntington Copper and Sulphur (L.)	23s.
4	4	—	—	Pannicello Copper (Limited)	25s.
10	10	6½	6½	Rio Tinto (Limited)	52s. 6d.
20	20	7	7	Ditto, 7 per cent. Mortgage Bonds.	13½
100	100	5	5	Do. 5 p. cent. Mor. Deb. (Sp. Con. Bds.)	59
10	10	10	10	Tharsis Copper and Sulphur (Lim.)	21½
10	7	20	17½	Ditto New	14½
1	1	—	—	Yorke Peninsula Mining (Limited)	5s.
1	1	—	—	Ditto, 15 per cent. Guaranteed Pref. 12s. 6d.	
				GOLD, SILVER.	
1	1	—	—	Australian Mines Investment (Lim.)	5s.
5	5	30s.	10s.	Richmond Mining (Limited)	9s. 3s. 9

OIL.					
10	7	5	5	Dalmeny Oil (Limited)	6½
1	1	25	15	Oakbank Oil (Limited)	35s.
1	5s.	—	15	Ditto	11s.
10	10	7½	2	Uphall Mineral Oil (Limited) "A"	6½
10	10	—	—	Ditto "B" Deferred	10
10	8½	17½	17½	Young's Paraffin Light & Mineral Oil (L)	14½

MISCELLANEOUS.					
80	25	5	5	London & Glasgow Engineering & Iron Shipbuilding (Limited)	21
7	7	10	5	Phospho Guano (Limited)	6½
10	10	6	5	Scottish Wagon (Limited)	9
10	4	6	5	Ditto New	60s.

NOTE.—The above lists of mines and auxiliary associations are as full as can be ascertained, Scotch companies only being inserted, or those in which Scotch investors are interested. In the event of any being omitted, and parties desiring a quotation for them and such information as can be ascertained from time to time to be inserted in these lists, they will be good enough to communicate the name of the company, with any other particulars as full as possible.

J. GRANT MACLEAN, Stock and Share Broker.
Post Office Buildings, Stirling, March 6.

MECHANICAL STOKERS AND SMOKE PREVENTERS.

The economy resulting from regular and careful feeding has long been recognised, and consequently mechanical stokers have, especially in the Lancashire district, been for some years past in great favour. Mention was made in the *Mining Journal* several months ago of an improved apparatus of this class, invented by Mr. H. C. CARVER, of Llanidloes, Wales, and in addition to its having been largely adopted, a further recognition of its merits has been afforded in the award of Honourable Mention at the Paris Exhibition. Mr. Carver has taken especial care to make the stoker efficient, neat, durable, and difficult to derange, and to have the parts accessible and replaceable with ease, rapidity, and accuracy. Amongst its novelties are—1. Its ability to reduce lump coal of moderate size into "nuts" with certainty and regularity by an apparatus made chiefly of hardened steel.—2. A fuel distributor, consisting of a drum rotating on a horizontal axis, and provided with blades formed so as to propel the fuel over the whole of the grate area. It is mounted upon the fire-door in such a manner that the opening and closing of the latter are not interfered with; and as a result of the arrangement, no reduction in the height of the doorway is required, as in the case of those stokers which have the distributing apparatus placed over the doorway.—3. The readiness with which the fuel feed may be adjusted to any rate, up to as much as 7 cwt. per furnace per hour, by merely turning a small handle. This feature is an important one in cases in which the demand for steam is intermittent, or of a fluctuating character.—4. A simple and inexpensive flexible shaft for driving the distributor, which reduces the gearing required for this purpose to a minimum.—5. Various devices, unaccompanied by any objectionable complication of parts, for making the bearings, whether vertical or horizontal, self lubricating, and for causing the spent oil to be discharged in most cases into the furnace.—6. The method of attaching it to the boiler, without drilling any holes in the latter, which is of such a nature that the machines may be readily transferred from one boiler to another of different dimensions, and which, therefore, obviates the necessity of having machines for spare boilers.

It appears that the inventor had several years' experience in Lancashire in the manufacture of mechanical stokers, during which time he became acquainted with many of the defects in other machines of this class, and he believes that he has been successful in avoiding many of them. It is mentioned that each stoker feeds one furnace, and forms an entirely independent machine. Hand firing can be resorted to without any impediment, and no boiler rivets are concealed from view by the stoker. For double fuel boilers two machines, and entirely independent of each other, are employed. The strength of the various parts of the coal-breaking apparatus is so proportioned that in the event of its becoming arrested by unduly hard foreign substances (such as pieces of metal) accidentally mixed with the fuel, the driving belt slips, and no damage is done to the machine. The precise character, however, of the stoker will be best understood from the subjoined description, and the various details of the machine are explained by the drawings, wherein Fig. 1 is a front view of the stoker attached to the boiler, and Fig. 2 the sectional view thereof:—



Fig. 1.

The stoker is one in which the distribution of the fuel is done by a fan, and an inspection of the engravings will disclose three very decided points of novelty—(a) the means adopted for crushing the fuel; (b) placing the fan or distributor in the furnace door; and (c) driving the same in the most direct manner by a flexible shaft thus dispensing with complicated gearing. The machine is driven by a belt on the pulley, *b*, which rotates a vertical shaft, carrying a worm, *e*, gearing into a worm wheel, the movement of which imparts a travelling motion to a flat chain about 8 in. wide, composed of

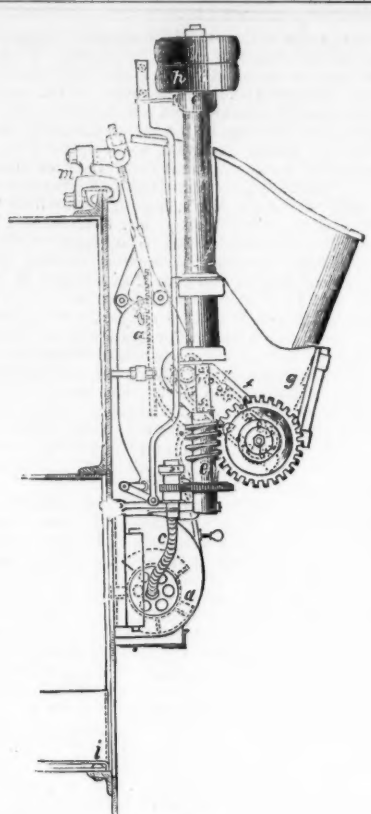


Fig. 2.

C-shaped steel links strung upon steel pins. The upper part of the chain is carried on a shaft parallel to the worm shaft, and several of its links are made with claws, *f*, by means of which, and the reversed teeth, *g*, inside the front of the hopper, any lump coal the hopper may contain is effectually broken up; the action, be it noted, being that of splintering, and not one of pulverisation, which, as usually done by rollers, is not altogether perfect in its result. Mr. Carver's experience is that rollers are not to be relied upon for the purpose of crushing lump coal. The breaking completed, the comminuted fuel is carried by the under portion of the chain up to a barrier or plate, which may be adjusted by a handle working the racks, *a*. This barrier plate may be so elevated as to permit any desired proportion of the fuel to be discharged over it, and dropped through a passage on to the distributor, whilst the remainder is carried back by the chain to the hopper. The wide range (lying between absolute zero and as much as 10 cwt. per hour if desired) of fuel supply is of great importance in cases in which the demand for steam is intermittent, as during periods of inactivity suitable adjustments of the feed valve and damper enable the fire to be kept in readiness for an active demand without incurring an excessive production of steam meanwhile.

The fan or distributor, *d*, upon which the coal falls after being discharged over the barrier, is mounted on a horizontal axis, and is driven from the upright worm shaft by the flexible shaft, *c*, so as to admit of opening the furnace door when necessary. It carries vanes or blades so shaped as to distribute the fuel evenly over the fire; and the perforations in its sides, by the currents of air they generate, keep the bearings cool. Should from any accidental cause the vanes be seized and the revolution of the fan impeded, to prevent damage to the dependent parts a friction clutch in one of the toothed wheels enables it to slip until the obstacle is removed; in fact, the motion of the fan may be arrested by gripping the flexible shaft in the hand. The machine may in many cases be applied to existing fire fronts, and in no case is it necessary to diminish the dimensions of the fire-door opening. The mode of attachment is clearly shown, and save in exceptional cases it is not necessary to make holes in the boiler. So easily may it be affixed to the furnace that an intelligent fireman can readily transfer it from one to another, thus rendering it unnecessary to keep machines standing idle upon "spare" boilers. In any case of need hand-firing can be resorted to in the usual way, and another point is that none of the boiler rivets are concealed from view by the application of the machine. The strength of the various parts is so proportioned that should the coal-breaking apparatus become arrested, by pieces of metal, &c., the belt slips off and no breakage occurs. Whilst the machine is self-contained the parts are readily accessible, and the apparatus, being provided with self-lubricating bearings containing a good supply of oil, may readily be kept in good order. Where necessary to prevent the exudation of oil from the bearings, the latter are constructed so as to cause the oil to flow to the inside of the machine, which consequently may easily be kept in a cleanly condition.

In the stoker illustrated automatically movable bars are not shown, but there is a simple arrangement enabling them to be rocked by hand lever, so as to cause the ash to fall between the bars. In some, however, which Mr. Carver has at work the automatic movement is added, and with this he obtains improved results, the clinker being effectually removed by being carried to the end of the grate, over which it falls into the ash-pit, and from whence it is occasionally raked away. A false furnace bottom plate or lining, partly shown at *i*, is also provided, by which the movable or other fire-bars (which are usually carried on bearers secured by bolts or studs in the flue plates) can be applied without drilling any holes in the flues, and which is sent from the maker with the brackets properly adjusted, thus preventing risk of error when the bars are being put in their places. The use of the machine prevents smoke, and, as compared with hand firing, effects a large saving in fuel, and increases the rate of steam generation, or, in other words, diminishes the amount of boiler power required.

HOLLOWAY'S OINTMENT AND PILLS—CHEST PRESERVATIVES.—At all seasons of the year the rate of mortality from diseases of the lungs is very great. Holloway's ointment well rubbed upon the chest, aided by his pills, arrests all mischief. These cleansing medicaments exercise the most salutary and restorative influence over the whole contents of the pleural cavity. Air tubes, nerves, blood-vessels, and all other tissues feel their wholesomely potent power, more particularly in their thoroughly purifying both venous or arterial blood, by promoting the free circulation of air. Neither ointment or pills contain any noxious ingredient whatever, but their balsamic nature nourishes rather than irritates the system, and kindly subdues untoward symptoms till all is well once more.

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BAILEY'S WATER-MOTOR HAULING AND PUMPING ENGINES.

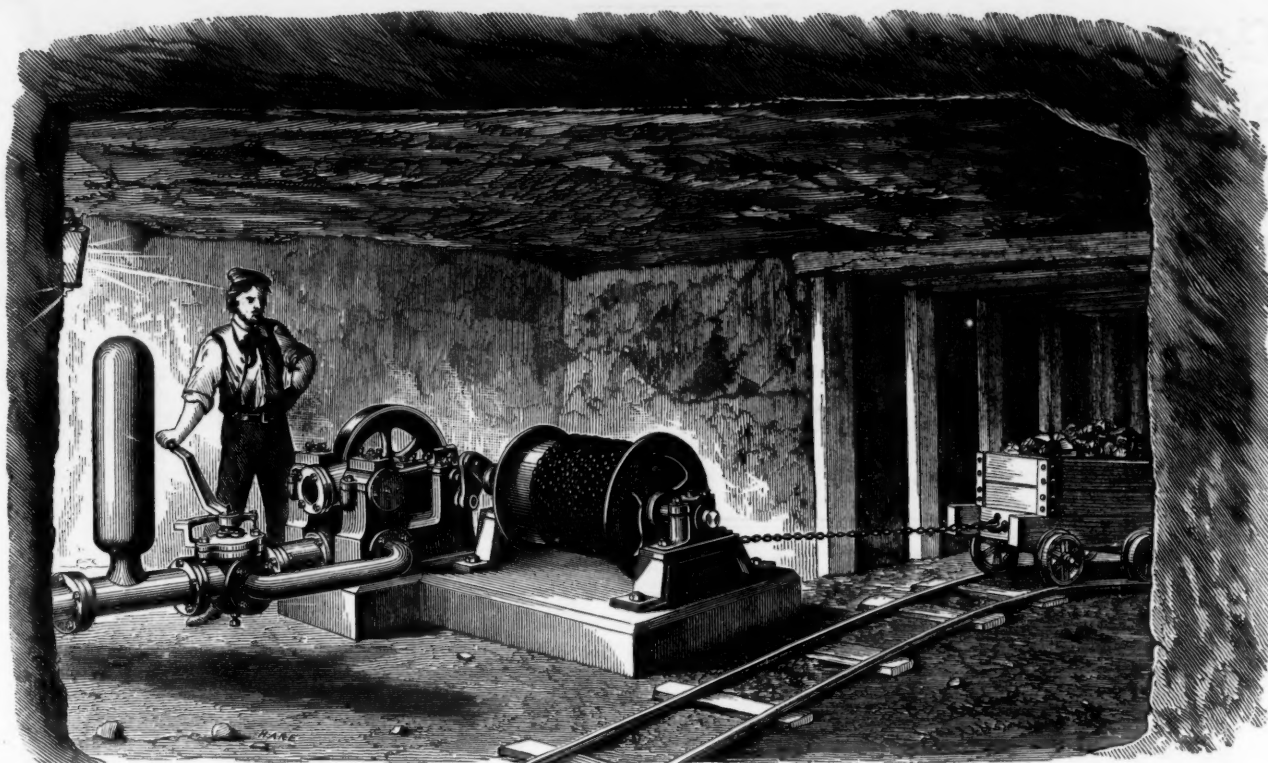


Fig. 1.

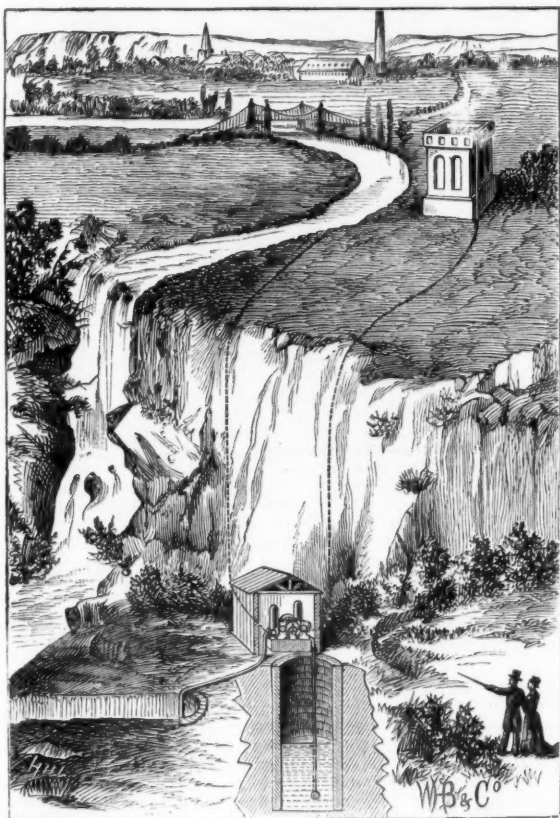


Fig. 2.

BAILEY'S WATER MOTOR HAULING AND PUMPING ENGINES.

Messrs. W. H. BAILEY and Co., the well-known valve and pump makers, of the Albion Works, Salford, Manchester, have of late years devoted considerable thought to the use of water power for manufacturing and mining purposes, their efforts having been especially directed to the construction of piston engines for communicating motion derived from water pressure in column, a class known as water motors in contradistinction to turbines and water wheels. It is generally admitted that of all machines whose power is derived from water the piston engine gives the greatest amount of useful effect. Of course where water is in great abundance as in streams, or waterfalls and rivers, the turbine or water wheel is always to be recommended as being lower in price and better in many respects than piston engines. But where water exists in column, as in the pipes of a town supply, or in the rising main of a mine, or in the pipes used for drainage, a piston engine constructed on good lines must be considered the best, and where there is a good head the machine will very often be cheaper in price than any other method of communicating power by means of water.

Messrs. Bailey and Co. make different classes of motors; they have what is called Bailey's patent one-stroke hydraulic engine, for warehouse and factory lifts and hoists, several of which are at work in Manchester and other centres of industry; these we may refer to and illustrate at some future time. At present our chief desire is to call attention to a type used for mine purposes, especially for lifting and for incline work. Fig. 1 is a view of a piston engine in use by the Lever Edge Coal Company, Bolton, and also at the quarries of Thomas Dixon and Sons, Whitehaven.

The hydraulic winding engine may be briefly described as consisting of an oscillating cylinder motor, so arranged with the parts of inlet and outlet that the pressure of water tends to lift the valves from their faces, the real wear and tear being thus on the back of the valves, which can be replaced by ordinary workmen after long working. Messrs. Bailey and Co. claim this as a very important feature in their motors, for they truly say the water being always on the moving surfaces constantly lubricates them, and the faces being kept together by means of slide-blocks and bolts, which may be replaced when worn, causes the machines to be durable and not always under repair, as is the case with those motors whose valves receive the pressure of the water upon the top sides. The valves and trunnions are of enormous dimensions compared with the diameter of the cylinders and pistons, for the very reason that they may be left for months without any fear of wear rendering them inefficient. The Brighton Guardian is, we are informed, printed by two of these engines, and so great has been the satisfaction of the proprietors at their performance for some months past at that

fashionable resort, that it has no doubt influenced the Town Council of the borough to give preference to Messrs. Bailey and Co.'s plan for raising water 180 ft. high by means of one of their water motor pumping engines, the actuating pressure being 60 ft. head. Messrs. Bailey and Co. have, they tell us, this contract now in course of execution. They are used from $\frac{1}{2}$ -horse power to 100 horse power, and for printing, sausage chopping, ventilating, organ blowing, and many similar purposes. Those ranging from $\frac{1}{2}$ -horse to 6-horse power are, we understand, giving satisfaction in various parts of the country. Those less than half horse-power are used for driving sewing machines, and the last patent taken out by Mr. W. H. Bailey is a little motor made of brass tube, with a maintaining power, which, when coupled to a cistern of a few feet head, will keep a clock going in a house permanently. It takes half a pint a day to keep a substantial looking clock going—we mean one of those large pieces of furniture in which our ancestors delighted. Mr. Bailey says that the circulars will be out for this when he has completed his "new wing." We by no means wish to imply that Mr. Bailey intends to fly as his next feat, for he refers to a great extension of his already extensive works in Salford, where his men are, even in these bad times, now working overtime. We hope that those who neglect advertising will take a hint in these days of empty workshops from Messrs. Bailey and Co.'s example. Mr. Bailey has one of these clocks going in his works. He says there is nothing novel about the clock, except the winding up. The movement consists of an ordinary escapement with weight and pendulum, but just before the weight runs down it is "hitched up" by the baby motor, which can be coupled to the town water or to a cistern by $\frac{1}{2}$ -in. bore tube. He feels dependent only when the "plumbing fender" is mentioned as the man who would have to couple up the clock. He wishes some one would discover how to do away with the present "domestic engineer," or else teach him how to fix pipes which are not always giving trouble. As we are on this point, do not architects consider themselves much to blame for their total disregard of all rules and all experience when they leave householders and tenants to men whose sole energies seem devoted to the destruction of domestic peace?

Returning to the hauling engine as illustrated, it is so arranged that by turning the exhaust pipe into the inlet the motion reverses, and *vice versa* on an incline. There is not any trouble with the "dead centre," as there is always a little slack at starting, and the wagons either empty or full are under easy control. This in some cases may be considered a disadvantage where the man in charge does not stand near the motor, and when the winding is not for incline purposes. For such cases Messrs. Bailey and Co. make a double-cylinder diagonal engine, which, as will be understood by mechanical men, has no dead centre, some pressure always being on the crank, whatever the position.

There are many purposes to which these hydraulic machines may be applied. The column of water in the rising main may be used where there are facilities for its running back to the sump, on hill sides, or in quarries they may be adopted where the water can run away. There being no boiler, no man to "fire-up," no escape of steam will be advantages which will be taken into consideration by those who will weigh their advantages *versus* those of steam motors.

Fig. 2 is an illustration of how the water-motor pumping engines are applied. It will be seen from the illustration that the supply of water is taken from the river above the fall, and this head works an engine to pump water from a well to the cistern on the hill; this application will be found useful, and has been highly approved where adopted. These water motor pumps are entirely automatic; that is to say, when the cistern on the hill obtains sufficient water it closes by means of the ordinary ball cock or valve, which causes

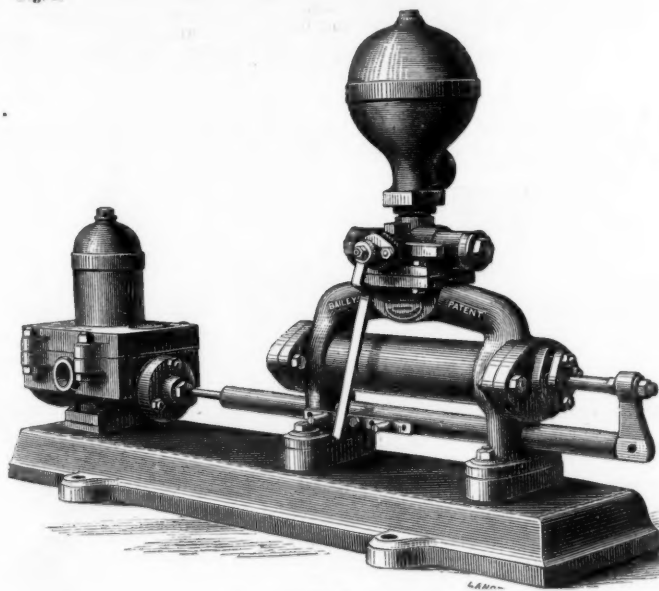


Fig. 3.

the engine to stop. When, however, the water falls below the proper line the water engine automatically commences to work.

Fig. 3 is an illustration of the water motor pumping engine, similar to those being made for the Brighton water supply by Messrs. Bailey and Co. at the present time. The motor cylinder is made of cast gun metal, fastened in its place by a simple method. A furnace of special construction is used to warm the cast-iron portion to about 300°. The cylinder is kept cool, and is then slid with ease into its position. The contraction of the iron fastens both ends tight enough to resist a pressure of 4 tons on the square inch. There is, as we have before observed, no dead centre in these pumping engines. This being so, they can be stopped when required by a ball-cock on the outlet pipe, so as to be perfectly automatic in stopping and starting.

In concluding our notice of those motors we may say that, as a special department, Messrs. Bailey and Co. have devoted considerable attention to testing machinery for engineers, boiler makers, railway companies, and others. The firm have in hand some testing cabinets of an expensive nature, for testing locomotive gauges for the Indian State Railways; those consist of a small hydraulic pump with union joints, nipples and couplings, fitted in a strong teak case. A mercurial tube about 30 ft. high is fastened in a proper manner at the joints; the glass tubes are in 4-ft. lengths, the mercury being in sight all the length of the indicated board. These are probably the most complete and tallest open column mercurial gauges ever made, the formula of pressures having been carefully verified by Mr. Baldwin, the chief engineer of the Manchester Mutual Boiler Insurance Company. One of Thurston's torsional testing machines has just been sent to Queen's College, Cork; and another by them to the Royal Military Engineering College, Chatham. A full account of the machines, illustrated, for testing all sorts of materials of construction is in the press, and it will be published early in March. Messrs. Bailey inform us that this book will be about the most complete collection of testing machines ever published under one cover. Tubes, boilers, bottles, cement, valves, copper, coal, steel, iron, wood, granite mortar, and any material used by architects or engineers, to be crushed, burst, or broken, either by transverse, torsional, tensile, or compressional force will there be treated upon, illustrated, and priced. The first edition will cost this energetic firm 250*l.*; and although it may be some time before the investment brings repayment, we venture to think that such enterprise should be respected by those who take an interest in the value of materials of construction.

PREVENTING OVERWINDING IN MINES.—The improved detaching hook invented by Messrs. GRABOWSKI and BLOOD, of Birmingham, consists principally in the construction of two or more plates irregular in outline, but corresponding to each other, having segmental slots, and this for producing the required motion in connection with the said plates; there are employed two or more hooks for holding the upper link which is connected to the chain or rope, while at the extreme is another link for carrying the load in ascending at the point, beyond which the load must not be raised, is fixed an iron ring having an aperture through which the winding chain or rope passes; the projecting parts of the plate then come in contact with the lower part of the said ring, causing the plates to move, and the hooked parts of the said plates will then enter the ring, or that portion of the said ring which is constructed with a circular flange, and is then engaged or secure; the bottom link slides into a slot in the plates, fixing the said plates in that position that they cannot move, and thus sustain the load after the winding rope or chain is disconnected.



PARIS EXHIBITION, 1878.

GOLD AND SILVER MEDALS AWARDED for
Steam-Engines & Boilers, also the Special Steam Pump,
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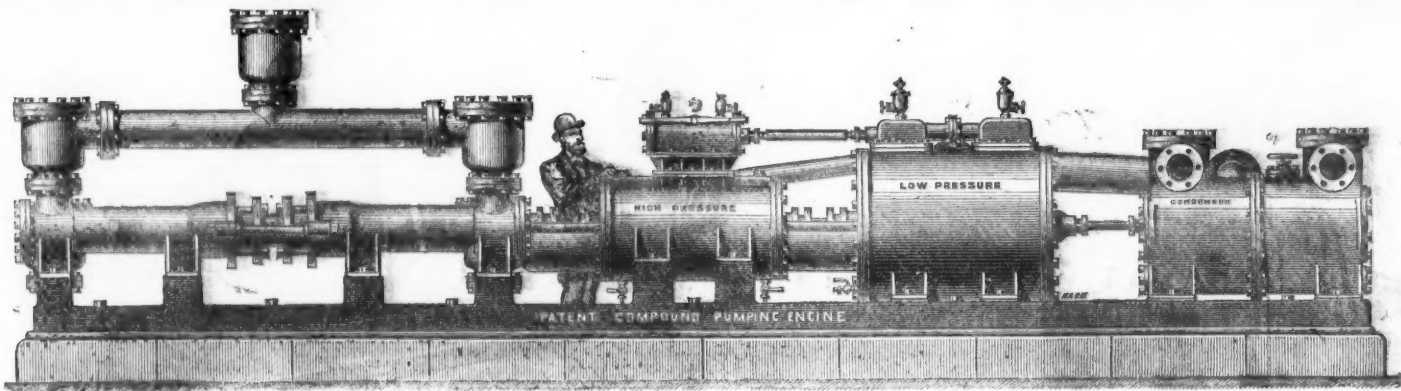
THE "SPECIAL"

DIRECT-ACTING

COMPOUND PUMPING ENGINE

For use in Mines, Water Works, Sewage Works,

And all purposes where Economy of Fuel is essential.



THE "SPECIAL" DIRECT-ACTING COMPOUND PUMPING ENGINE, WITH AIR-PUMP CONDENSER.

After several years of successful application for all purposes to which steam-driven pumps can be applied, THE "SPECIAL" STEAM PUMP STILL MAINTAINS THE FIRST POSITION IN THE MARKET, notwithstanding that it alone—of all direct-acting pumps—has been subjected to the great variety of severe tests that must be encountered in such a period of time. Some valuable improvements have been suggested in the course of a long experience, and their adoption has rendered the apparatus at once

THE SIMPLEST AND MOST CERTAIN IN ACTION.

The illustration shows an extension of the principle of this Pump to a Compound Steam Pumping Engine, by which the economical advantages resulting from the expansion and condensation of steam are very simply and effectively obtained. The steam after leaving the high-pressure cylinder is received into and expanded in the low-pressure cylinder, and is thus used twice over before being exhausted into the condenser or atmosphere. The Engine combines simplicity, certainty of action, great compactness, fewness of parts, and consequent reduction in wear and tear.

Several thousands of the "Special" Steam Pumping Engines, with high-pressure cylinders only, are in use in British and Foreign Mines, Water Works, &c.,—and for confined situations, or where Engines of a comparatively small size only are necessary, they will still meet all requirements—but their application will be very largely increased, since it has been found practicable to embrace the important features of expanding and condensing the steam, so that increased power may be obtained, and the consumption of fuel greatly economised.

THE "SPECIAL" DIRECT-ACTING COMPOUND STEAM PUMPING ENGINE is the most simple appliance for deep mine draining and general purposes of pumping ever practically developed, and the first cost is very moderate compared with the method of raising water from great depths by a series of 40 to 50 fathom lifts. No costly engine-houses or massive foundations, no repetition of plunger lifts, ponderous connecting rods, or complication of pit-work are required, while they allow a clear shaft for hauling purposes.

SIZES AND PARTICULARS.

	8	8	8	10	10	10	10	12	12	12	12	14	14	14
Diameter of High-pressure Cylinder.....In.	8	14	14	18	18	18	18	21	21	21	21	24	24	24
Ditto of Low-pressure Cylinder.....In.	4	5	6	5	6	7	8	6	7	8	10	7	8	10
Ditto of Water Cylinder.....In.	24	24	24	24	24	24	24	24	24	24	24	36	36	36
Length of stroke.....In.	3900	6100	8800	6100	8800	12,000	15,650	8,800	12,000	15,650	24,450	12,000	15,650	24,450
Gallons per hour approximate.....	3900	6100	8800	6100	8800	12,000	15,650	8,800	12,000	15,650	24,450	12,000	15,650	24,450
Diameter Suction and Delivery.....In.	3	3	4	3	4	5	6	4	5	6	8	5	6	8
Diameter High-pressure Steam Inlet.....In.	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2
Diameter Low-pressure Steam Exhaust.....In.	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	1 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2
Height in feet water can be raised with 40 lbs. pressure per square inch in Non-condensing..	360	330	160	360	250	184	140	360	264	202	130	360	275	175
Ditto ditto ditto—with Holman's Condenser...	480	307	213	480	333	245	187	480	352	269	173	480	367	234
Ditto ditto ditto—with Air-pump Condenser...	600	384	267	600	417	306	335	600	440	337	216	600	459	203

CONTINUED.

	16	16	16	18	18	18	18	21	21	21	24	24	24	30	30
Diameter of High-pressure Cylinder.....In.	16	16	16	18	18	18	18	21	21	21	24	24	24	30	30
Ditto of Low-pressure Cylinder.....In.	8	10	12	8	10	12	14	10	12	14	10	12	14	12	14
Ditto of Water Cylinder.....In.	36	36	36	36	48	48	48	48	48	48	48	48	48	48	48
Length of stroke.....In.	15,650	24,450	35,225	47,950	13,650	24,450	35,225	47,950	24,450	35,225	47,950	24,450	35,225	47,950	47,950
Gallons per hour approximate.....	15,650	24,450	35,225	47,950	13,650	24,450	35,225	47,950	24,450	35,225	47,950	24,450	35,225	47,950	47,950
Diameter Suction and Delivery.....In.	6	8	9	10	6	8	9	10	8	9	10	8	9	10	10
Diameter High-pressure Steam Inlet.....In.	2 1/2	2 1/2	2 1/2	2 1/2	3	3	3	3 1/2	3 1/2	3 1/2	4	4	4	5 1/2	5 1/2
Diameter Low-pressure Steam Exhaust.....In.	3	2	3	3	3 1/2	3 1/2	3 1/2	3 1/2	4	4	5	5	5	6 1/2	6 1/2
Height in feet water can be raised with 40 lbs. pressure per square inch in Non-condensing..	360	290	160	118	456	292	202	149	397	276	202	518	360	264	562
Ditto ditto ditto—with Holman's Condenser...	480	307	213	154	603	389	269	198	528	363	269	691	480	352	750
Ditto ditto ditto—with Air-pump Condenser...	600	384	267	191	750	486	337	248	600	450	337	804	600	440	957

PRICES GIVEN ON RECEIPT OF REQUIREMENTS.

Any number of these Engines can be placed side by side, to work in conjunction or separately as desired, thereby multiplying the work of one Pump to any extent.

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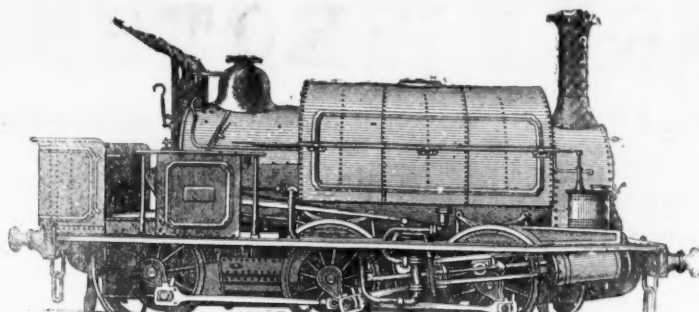
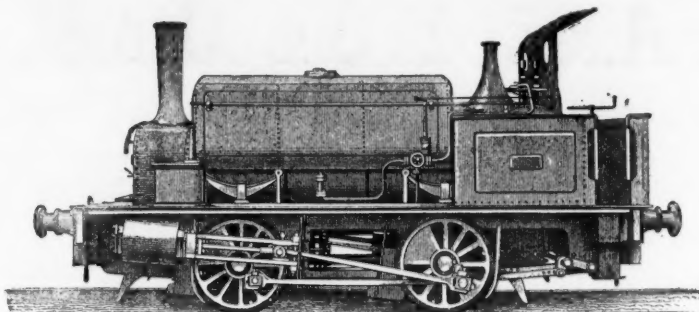
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CLASS OF

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EITHER ON FOUR WHEELS OR SIX, OF
VARIOUS GAUGES,

IN WHICH EXTRA STRENGTH AND DURABILITY ARE COMBINED WITH SIMPLICITY AND ECONOMY IN REPAIRS.



FIRE BOXES—Copper. TUBES—Brass. TYRES—Steel. AXLES—Steel. BOILER PLATES AND MACHINERY of the best Yorkshire Iron. NEW LOCOMOTIVES, with Cylinders 8 in., 10 in., and 13 in. diameter, always in stock or in progress. SECOND-HAND LOCOMOTIVES, of various sizes FOR SALE OR HIRE. PRICES AND SPECIFICATIONS ON APPLICATION

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HADFIELD'S STEEL FOUNDRY COMPANY.

FIRST PRIZE MEDALS AT LEEDS, MANCHESTER, AND
WREXHAM EXHIBITIONS, 1875 AND 1876.

ATTERCLIFFE, SHEFFIELD,

DEVOTE THEIR EXCLUSIVE ATTENTION TO THE MANUFACTURE OF

CRUCIBLE STEEL CASTINGS,

FOR

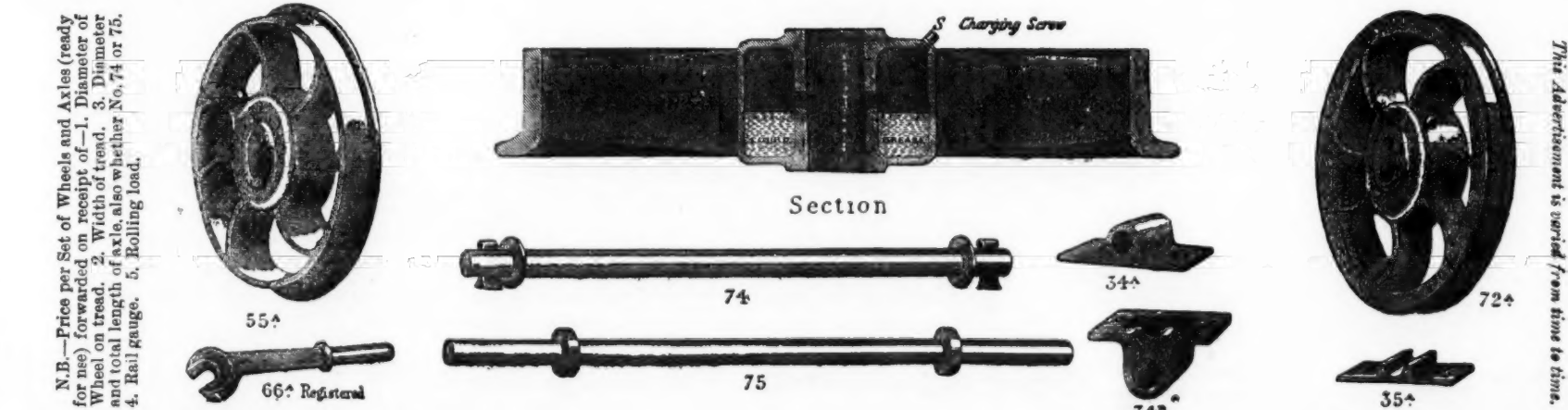
Engineering & Mining Purposes,

AND ARE THE SOLE MAKERS OF

Hadfield's Self-oiling Steel Wheels

(PATENTED).

These possess advantages held by no other wheels, and are specially adapted for Collieries, Ironstone Mines, Slate Quarries, Lead and Copper Mines, &c., &c., where LOOSE Wheels are used (i. e., those revolving upon their own axles). By the old system of lubricating loose wheels, it is well known this is attended with constant labour and excessive waste; and as so little of the grease or oil applied reaches the wearing surfaces, and as re-greasing can only take place at fixed parts of the workings, the bosses of the wheels and bearings of the axles soon become dry, and cut each other: thus causing enormous wear and tear, and necessitating extra labour, haulage power, and expense. These and numerous other defects are entirely remedied by these wheels, as will be readily seen from the following illustrations and advantages claimed.



The following are a few of the numerous Advantages claimed by the above Self-oiling Wheels:—

- 1.—Two-thirds (at least) less grease or oil is required than at present used by any known method of lubricating Mining Wagons, whether by hand, machine, or otherwise.
- 2.—These wheels effect a very great saving in haulage power; also wear and tear—being so constructed as never to allow the bearings to become dry. The revolving of the wheel leads out the oil as required, and immediately the wagon stops the lubricator ceases its action.
- 3.—No waste of grease can occur, no matter in what position the wagon may be placed, when discharging its contents (even if up side down); and when the wagons are not in use it is utterly impossible for any grease to escape, as it is all stored below the outlet (as shown above).
- 4.—When once these wheels have been charged with liquid grease (which can be done by any inexperienced person) they do not require any attention or re-greasing whatever for several weeks or even months afterwards, in proportion to the distance travelled.
- 5.—These wheels can be readily fixed to any description of either wood or iron carves now in use, whether the wheels are upon the inside or outside of the frame.
- 6.—They are exceedingly simple in construction, have no detail, and are not liable to get out of order.
- 7.—They possess great strength, durability, and extreme lightness, being made of CRUCIBLE STEEL.

Where FAST Wheels and Axles are adopted instead of Loose ones, as shown above, see our Illustrated Sheets of Drawings Nos. 2 and 3 of

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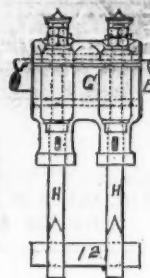
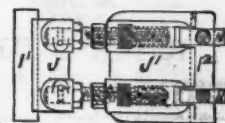
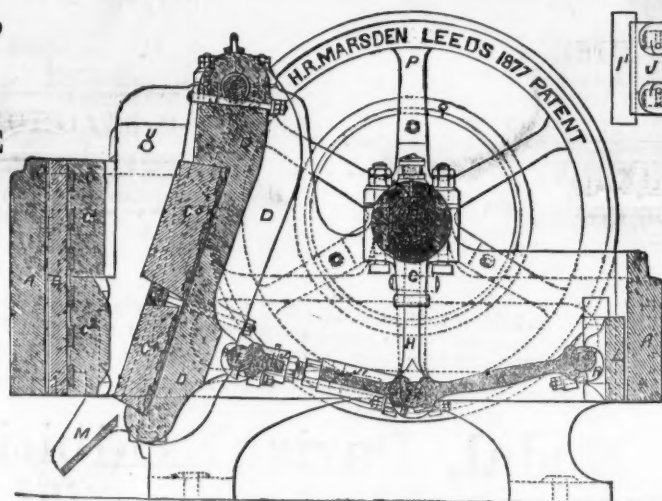
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70

PRIZE MEDALS.



READ THIS—

Wharfedale Lime Works, Maryport, Whitehaven,

November 7, 1878.

H. R. MARSDEN, Esq., Soho Foundry, Meadow-lane, Leeds.
DEAR SIR,—The machine I have in use is one of the large
size, 24 in. by 12 in. The quantity we are breaking daily with
this one machine is 250 tons, the jaw being set to break to a
size of 2½ in. We have, however, frequently broken over
300 tons per day of ten hours, and on several occasions over
350 tons during the same period. The stone we break is the
blue mountain limestone, and is used as a flux in the various
ironworks in this district. We have now had this machine in
daily use for over two years without repairs of any kind, and
have never had occasion to complain of any inconvenience in
using the machine. I hope the one you are now making for
me may do its work equally well. The cost—including EN-
GINE-POWER, COALS, ENGINEMAN, FEEDING, and all EXPENSES
OF EVERY KIND—is just 3d. per ton. Should any of your
friends feel desirous of seeing one of your machines at work,
I shall have much pleasure in showing the one alluded to.
I am, dear Sir, yours very truly,

AND THIS—

Wharfedale Lime Works, Aspatia, Cumberland,

July 11th, 1878.

H. R. MARSDEN, Esq., Soho Foundry, Leeds.
DEAR SIR,—We are in receipt of your letter of 4th inst. I
may just state that the stone breaker above named has been
under my personal superintendence since its erection, and I
have no hesitation in saying that it is as good now as it was
five years ago.
I am, dear Sir, yours faithfully,

FRANCIS GOULD.

GREATLY REDUCED PRICES ON APPLICATION.

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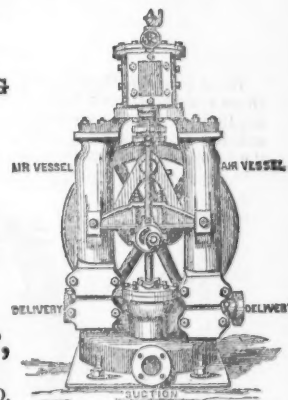
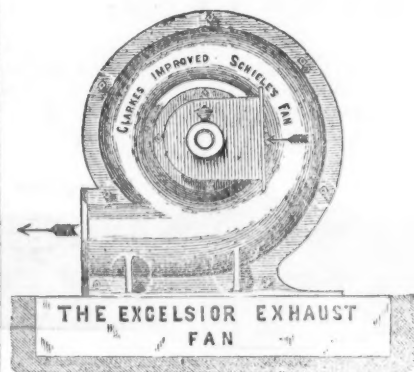
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